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THE PROBLEM OF THE NOMENCLATURE OF BACILLUS SUBTILIS AND BACILLUS VULGATUS

Carl Lamanna

Department of Microbiology, The Johns Hopkins
School of Hygiene and Public Health,
Baltimore, Maryland

At the Second International Congress for Microbiology (1936) the International Committee on Bacteriological Nomenclature established Bacillus subtilis Cohn emend. Prazmowski as the type species of the genus Bacillus. The action based on the study by Conn (1930) was followed by the selection of the small-celled B. subtilis Marburg strain in Conn's collection as the type culture of the species. Following the Congress two reports appeared indicating that in fact two small-celled species were masquerading in culture collections as B. subtilis, (Gibson, 1937; Lamanna, 1940). The Marburg strain selected as the type culture is identical with strains in collections labeled B. vulgatus (Lamanna, 1940).

Succeeding reports by Burdon, Stokes, and Kimbrough (1942), Gibson (1944), and Knaysi and Gunsalus (1944) agreed with the conclusion that the small-celled species Bacillus subtilis was separable into two species. In an initial study Smith, Gordon, and Clark (1944) did not separate B. subtilis into two species. Upon further study and reflection these investigators reversed their position (1952). Consequently at the present time there is unanimous agreement among students of the problem since Conn's time (1930) that the two different species are represented by the B. subtilis Marburg strain and the B. subtilis identified by Lawrence and Ford (1916). These developments make pertinent the present reexamination of the scientific merit of accepting the Marburg strain as the type culture of B. subtilis Cohn emend. Prazmowski.

Inasmuch as the Marburg strain is identical with the organism known in the past as B. vulgatus (Lamanna, 1940, 1942; Gibson, 1944; Smith et al., 1952) the designation of the Marburg strain as the type culture of B. subtilis requires the rejection of the name B. vulgatus and the validation of a new name for the other small-celled organism in culture collections called B. subtilis. Gibson (1944) and Smith et al. (1942) have suggested the retention of the Marburg strain as type strain, have placed B. vulgatus as a synonym of B. subtilis and designated B. licheniformis (Weigmann) Gibson as the valid name of the organism represented by the Lawrence and Ford strain of B. subtilis. The discussion that follows attempts to judge the scientific merit of these suggestions.

The designation by the International Committee of Bacteriological Nomenclature of B. subtilis Cohn emend. Prazmowski as type species logically required the selection as type culture of a culture originating in Prazmowski's study, provided one were available. Documentary evidence is lacking to prove such an origin for the Marburg strain or any other existing culture. Therefore, the selection of the Marburg strain as type culture can only rest on proof that this culture more closely fits Prazmowski's description of the organism he called B. subtilis than other possible candidates. Sad to relate Prazmowski's description is inadequate by current standards. Prazmowski provided no series of presently accepted significant diagnostic characteristics which can be employed for the comparative study of strains. He did record pictorially the method of spore germination of his organism. These drawings sufficiently impressed themselves upon the minds of contemporaries and a succeeding generation of bacteriologists to have led to their reproduction a large number of times in textbooks and the inclusion of the statement in manuals of determinative bacteriology of an equatorial mode of germination of spores as a characteristic of B. subtilis.

Lamanna (1940), and Knaysi and Gunsalus (1944) have called attention to two distinct modes of equatorial germination, germination with and germination without splitting of the spore case along the transverse axis. They believe these differing modes of germination to be of diagnostic value in the identification of small-celled species. During germina-

tion the Marburg strain characteristically splits the spore case, while the B. subtilis of the Lawrence and Ford type does not. In personal communications Prof. K. L. Burdon of Baylor University has indicated his ability to corroborate these observations in his as yet unpublished taxonomic studies of the aerobic spore-formers. The method of germination illustrated by Prazmowski appears to be equatorial without splitting of the spore case along the transverse axis. Therefore, with respect to the one definite characteristic we can associate with Prazmowski's organism the Marburg strain is dissimilar, the Lawrence and Ford type similar. This finding casts serious doubt on the validity of accepting the Marburg strain as the type culture of B. subtilis in preference to a culture of the Lawrence and Ford strain.

Gibson (1944) who published before the paper by Knaysi and Gunsalus appeared (1944) questioned the value of observations of modes of spore germination, particularly for purposes of routine diagnosis. Smith et al. (1952) who do not refer to the paper by Knaysi and Gunsalus have been satisfied with the acceptance of the Marburg strain as the type culture. In 1944 they did not believe the mode of spore germination sufficiently stable a character to be of taxonomic value.[1]

[1]As one who has studied the cytology of spore germination of many strains for a number of years, I have been impressed by spore germination as a process, not as a still picture. One must follow the birth of the new vegetative organism from the moment the spore loses its impermeability to dye and begins to bulge slightly to the time when the new organism undergoes fission. It is by studying the succession of appearances during the process and not by a glance at a particular moment in germination that one learns to appreciate the beautiful and consistent differences that exist between species. In the process of splitting of the spore case along the transverse axis, dependent upon how the new organism emerges from the spore case, the separated halves of the spore case may snap back toward each other. This is prone to happen when the emerging organism leaves the spore case at about 90° to the longitudinal axis, and may leave one with the false impression of germination without splitting along the transverse axis, if the action has not been followed from the beginning.

Knaysi and Gunsalus (1944) the only investigators who have studied spore germination in parent and dissociant cultures of the Marburg and Lawrence and Ford strains do not agree with these views. They found no differences in the modes of germination of dissociants from parent cultures. They could regularly determine and distinguish between the modes of germination of the two species.

If the point of view were to be accepted that the mode of germination is a valueless diagnostic character, the one definable characteristic possessed by Prazmowski's organism is declared taxonomically useless, and the wisdom of selection of Prazmowski's organism as a type species is placed in question. Possibly the decision to accept Prazmowski's organism may have been an unwise one, but this consideration is neither pro nor con in any defence of the choice of the Marburg strain as type culture. As long as the ruling remains that Prazmowski's organism is the type species of the genus Bacillus the type culture must be the one most closely resembling the original description. The Marburg organism is not the best choice since the Lawrence and Ford kind of organism resembles Prazmowski's picture of spore germination more closely.

If the Marburg strain is rejected as a true example of B. subtilis Cohn emend. Prazmowski it would appear to be proper to call this organism B. vulgatus (Flügge) Trevisan. This conclusion is based on the compilations of Gibson (1944) and Smith et al. (1952) of the names other than subtilis that have been affixed to organisms like the Marburg strain. Flügge (1886) would appear to be the first to have adequately studied this organism, but since he employed the trinomial B. mesentericus vulgatus, Trevisan's (1889) binomial B. vulgatus has priority.

If the Lawrence and Ford strain is rejected as an example of Prazmowski's B. subtilis a new name must be found for this organism. Gibson (1944) and Smith et al. (1952) have suggested B. licheniformis (Weigmann) Chester, a questionable choice. The identity of Weigmann's organism is obscure since its characterization is based almost entirely on cultural appearances of growth, properties which are now known to be greatly subject to dissociation and to subtle variations

in environment. It is extremely doubtful that Weigmann's organism is the B. subtilis represented by the Lawrence and Ford strain. Weigmann was so impressed with the swelling of the mother cell during sporulation of his organism that he placed his organism in the genus Clostridium, a genus not defined in his day as being constituted of anaerobes alone. Clostridium was employed by Weigmann and other bacterial taxonomists of his day to describe spindle-shaped sporulating organisms. The word clostridium is derived from the Greek and means little spindle. Chester who was familiar in 1901 with Weigmann's work recorded B. licheniformis as having "clavate forms at sporulation." Now both Gibson and Smith et al. place their B. licheniformis (Weigmann) in their keys under organisms whose "spores produce little or no swelling of sporangium" (Gibson), "sporangia only slightly swell if at all" (Smith et al.). Furthermore Weigmann recorded polar germination for his C. licheniforme, while everyone agrees that spore germination of the Lawrence and Ford strain is not polar. There are other points of disagreement between the descriptions of Weigmann, and Gibson and Smith et al. Since Weigmann was interested in C. licheniforme because of its possible effects on cheese ripening it is particularly pertinent to recall that he recorded the development of a neutral or alkaline reaction upon growth in milk. Contrarily Gibson recorded the development of slight acidity for the strains he studied.

In authoritative determinative bacteriology manuals that approximate in time the original naming of the spore-formers under consideration such as Migula (1900), Chester (1901), and Lehmann and Neumann (1901) B. subtilis and B. vulgatus (B. mesentericus vulgatus) were recognized as two species. The organism C. licheniforme Weigmann is mentioned in these texts but apparently was not considered worthy enough to be listed as a well-defined species. Now it would be reasonable to believe that if work in more recent times reaffirms the existence of two species, the oldest names accepted by the earlier taxonomists should be seriously considered as appropriate organisms.

CONCLUSIONS

The Lawrence and Ford strain of B. subtilis more closely resembles Prazmowski's B. subtilis than the Marburg culture. This finding should invalidate the choice of the Marburg strain as the type culture of B. subtilis Cohn emend. Prazmowski.

The Marburg strain is an example of B. vulgatus (Flügge) Trevisan.

It is improbable that the Lawrence and Ford type of B. subtilis is a representative of the organism named Clostridium licheniforme by Weigmann.

PROPOSAL

The Judicial Commission is asked to reconsider the designation of the Marburg strain as the type culture of B. subtilis Cohn emend. Prazmowski.

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OPINIONS 4, 6, 7, 8, 9, 10, 11, 12, 13, 14

Judicial Commission

The Judicial Commission has approved a revised Opinion 4 and new Opinions 6 to 14. They were referred by the Judicial Commission to the Editorial Board for final editing and publication. They become official upon publication providing an appeal is not taken to the International Committee on Bacteriological Nomenclature before the next Congress after publication.

Opinion 4 (Revised)

Rejection of the Generic Name Bacterium

The Judicial Commission at its meeting 4th September 1953 held in Rome noted that Opinion 4 had been challenged. This Opinion conserved the bacterial generic name Bacterium Lehmann and Neumann 1896, with type species Bacterium coli (Migula) Lehmann and Neumann, and the family name Bacteriaceae.

It was agreed that the Opinion be withdrawn, and that the two original requests, one for conservation and one for rejection, be submitted to the International Committee on Bacteriological Nomenclature for decision.

At the meeting of the International Committee on 7th September Dr. Kauffmann proposed (seconded by Dr. Thjøtta):

I. To reject the generic name Bacterium and to refer the matter back to the Judicial Commission.
II. To reject the family name Bacteriaceae.

Voting: For, 15; Against, 3.

At the meeting of the Judicial Commission on 8th September action was taken requesting the Chairman of the Judicial Commission to prepare Opinion 4 (Revised) in accordance with the foregoing directive of the International Committee and the draft to be circulated to the Commissioners and postal approval of the wording to be sought.

The following draft of Opinion 4 (Revised) was submitted to

the Commissioners, and approved. It is accordingly issued as the action of the International Committee on Bacteriological Nomenclature.

Opinion 4 (Revised).

1. The bacterial generic name Bacterium Ehrenberg 1828 is to be recognized as a nomen genericum rejiciendum (rejected generic name).

2. The bacterial family name Bacteriaceae is to be recognized as a nomen familiae rejiciendum (rejected family name).

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Editorial Board. Status of the generic name Bacterium, the specific name Bacterium coli and the family name Bacteriaceae. Ibid, 1(2):16-31. 1951.

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Opinion 6

Conservation of the Generic Name Chlorobacterium Lauterborn 1915 against Chlorobacterium Guillebeau 1890

The currently used bacterial generic name Chlorobacterium Lauterborn 1915 is a later homonym of Chlorobacterium Guillebeau 1890. The latter name has not been used in the literature of bacteriology for more than half a century. A Preliminary Statement (1951) by the Editorial Board outlining the problem was published, likewise a series of suggestions as to alternative actions (1953). At the meeting of the Judicial Commission on September 4, 1953, it was agreed that the existence of the earlier homonym Chlorobacterium Guillebeau should not constitute a bar to the use of the later homonym Chlorobacterium Lauterborn, and that the name Chlorobacterium Guillebeau should be rejected.

Opinion 6.
The bacterial generic name Chlorobacterium Lauterborn 1915 is conserved against the earlier homonym Chlorobacterium Guillebeau 1890. The generic name Chlorobacterium Guillebeau 1890 is placed in the list of nomina generum rejicienda.

REFERENCES

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Opinion 7

Nomenclature of the Organism Associated with Granuloma Venereum

Bier (1953) outlined the problem of determination of the name to be applied to the organism described by Aragão and Vianna (1913) as associated with and the probable cause of granuloma venereum. The synonymy is confused in the literature. The Judicial Commission, at its meeting of 5th September, 1953, after a review of the evidence, approved the following Opinion.

Opinion 7.

The bacterial species names *Encapsulatus inguinalis* Bergey *et al.* 1923, *Klebsiella granulomatis* Bergey *et al.* 1925, *Donovania granulomatis* Anderson, de Monbreun and Goodpasture 1944 are later synonyms of *Calymmatobacterium granulomatis* Aragão and Vianna 1913.

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Opinion 8

The Correct Species Name of the Streptococcus of Bovine Mastitis

Haupt (1952) proposed that the name of the streptococcus of bovine mastitis be accepted as Streptococcus agalactiae Kitt, although the binomial given by Kitt was Streptococcus agalactiae contagiosae. Hansen (1953) suggested that Kitt's single specific epithet of two words was changed by Lehmann and Neumann (1896) to a single word, and that the species name Streptococcus agalactiae Lehmann and Neumann has become generally recognized and is in common use. A poll of those working with the bovine mastitis streptococci showed general agreement that confusion would best be obviated by conservation of the Lehmann and Neumann species name against all synonyms having priority. The Judicial Commission, in its meeting of 5th September, 1953, approved in principle the conservation of the species name Streptococcus agalactiae, Lehmann and Neumann but with instructions to the Editorial Board to discuss certain matters with the proponents of the conservation. It is recognized that the description of the characteristics of the species as given by Lehmann and Neumann are probably inaccurate in some particulars, and differ from the descriptions of earlier writers. It is proposed that a type culture or standard culture of Streptococcus agalactiae Lehmann and Neumann be selected by a committee of experts, approved, and adequately described, and that the species be based upon this type culture rather than on the Lehmann and Neumann descriptions.

Opinion 8.
The species name Streptococcus agalactiae Lehmann and Neumann 1896 is conserved against all synonyms having priority.

REFERENCES

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Haupt, Herbert. The correct species name of the streptococcus of bovine mastitis. Ibid, 2(3):104-106. 1952.

Joint Secretaries. Minutes of the Judicial Commission meetings held at Rome in connection with the VI International Congress for Microbiology, Sept. 1953. Ibid.3(4):150. 1953.

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Opinion 9

Conservation of the Bacterial Generic Name Gallionella

The species name Gallionella ferruginea Ehrenberg 1838 was applied by the author to an organism which he erroneously regarded as a diatom, later shown to belong with the bacteria. A Preliminary Statement (1952) by the Editorial Board pointed out that the name Gallionella was an altered spelling (probably an attempt at better latinization of the name Gaillonelle) of the earlier generic name Gaillonella. The ascription of an iron bacterium to a genus of diatoms caused Griffith (1853) to propose the new generic name Didymohelix for the species D. ferruginea (Ehrenberg) Griffith. The generic name Didymohelix, has not been commonly accepted or used by bacteriologists, the species name Gallionella ferruginea has almost universally been used. The name Gallionella as a genus of diatoms has quite disappeared in the literature of algology.

The botanist's subcommittee on Bacillariophyta (diatoms) proposed that the generic name Gaillonella Bory (1823) be placed on the list of botanical nomina rejicienda. The reasons for and the implications of this action were ably analyzed by Ross (1952). This rejection also automatically rejects Gallionella as a generic name of diatoms. It was suggested that there remained no botanical reason for any "objection to conserving Gallionella in the sense of a genus typified by G. ferruginea Ehrenberg."

The Judicial Commission at the meeting 5th September 1953, in Rome approved the conservation of Gallionella Ehrenberg as a bacterial generic name.

Opinion 9.

Gallionella Ehrenberg is placed in the list of conserved names of bacterial genera (nomina generum conservanda) with the type species Gallionella ferruginea Ehrenberg.

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Opinion 10

Invalidity of the Bacterial Generic Name Müllerina de Petschenko 1910 and of the Species Name Müllerina Paramecii

De Petschenko (1910) published the name Müllerina for a genus of bacteria and included one species M. paramecii. In this preliminary paper he stated that a more extensive description of the organism would be given later. In a subsequent paper (1911) the names Drepanospira and Drepanospira muelleri were proposed and used. An Opinion was asked as to the nomenclatural status of these names for the organisms described. A preliminary statement was issued by the Editorial Board (1952). The following Opinion was approved by the Judicial Commission at its meeting on 5th September, 1953.

Opinion 10.

The generic name Müllerina de Petschenko 1910 and the species name Müllerina paramecii de Petschenko 1910 were not accepted by the author, hence were not validly published and are without standing in nomenclature. The later names Drepanospira de Petshcenko (1911) and Drepanospira muelleri de Petschenko 1911 were validly published and are not later synonyms.

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Opinion 11

Nomenclature of Species in the Bacterial Genus Shigella

A request for an Opinion as to the correct names of certain species in the genus Shigella was made by Boyd and Cowan (1951). It was supported by the recommendations of the Shigella Commission of the Enterobacteriaceae Subcommittee (1951). A Preliminary Statement was published (1951). The Judicial Commission in its meeting on the 5th September 1953, approved the following Opinion.

Opinion 11.

1. Shigella dysenteriae (Shiga) Castellani and Chalmers 1919 was validly published and is

legitimate as the name of the dysentery bacterium described by Shiga (1898).

2. The specific epithet flexneri in the species name Shigella flexneri Castellani and Chalmers 1919 is designated as a conserved specific epithet (epitheton specificum conservandum) for the species first described as Bacillus dysenteriae Flexner 1900.
3. The species name Shigella boydii Ewing 1949 was validly published and is legitimate. The specific epithet boydii in the species name Shigella boydii is to be conserved (epitheton specificum conservandum).
4. The species name Shigella sonnei (Levine) Weldin 1927 was validly published and is legitimate. The specific epithet sonnei in the species name Shigella sonnei is to be conserved (epitheton specificum conservandum).
5. A type or standard culture is to be designated by the Enterobacteriaceae Subcommittee of the International Committee on Bacteriological Nomenclature for each of the four species. Such cultures as far as possible shall be maintained in each of the national Type Culture Collections and in the International Shigella Center, Chamblee, Georgia, U.S.A.
6. A culture belonging to the species Shigella flexneri, S. boydii, or S. sonnei could be completely identified by appending to the name "serotype _____" with the appropriate designation).

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Opinion 12

Conservation of Listeria Pirie 1940 as a Generic Name in Bacteriology

Listerella Pirie 1927 was proposed as a bacterial generic name. When the attention of the author was called to the fact that Listerella Pirie was a later homonym of the generic name of a myxomycete, he (1940) proposed to replace Listerella by Listeria. This replacement has in general been accepted by those working in medical bacteriology. Becker (1951) noted that Listeria Pirie is a later homonym of Listeria Necker 1790 applied to a genus of flowering plants. Under the rules of the International Code of Bacteriological Nomenclature Listeria Pirie is illegitimate. However, the suppression of both Listerella and Listeria as bacterial generic names would cause much confusion and resentment.

The generic name Listeria Necker was apparently validly

published to include certain segregates from the genus Oldenlandia in the family Rubiaceae. The name has not been used by botanists since the time of its introduction (over a period of more than a century and a half). The Judicial Commission at its meeting on September 4, 1953, agreed to conserve Listeria Pirie 1930 as a generic name in bacteriology and approved the following opinion.

Opinion 12.

1. Listeria Pirie 1940 (type species Listeria monocytogenes (Murray, Webb, and Swann) Pirie 1940 shall be placed in the list of conserved names of bacterial genera (nomina generum conservanda).

REFERENCES

Becker, Elery R. The legitimacy of certain generic homonyms in bacteriology and protozoology. Int. Bull. Bact. Nom. and Tax. 1(3):103-112. 1951.

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Opinion 13

Conservation and Rejection of Names of Genera of Bacteria Proposed by Trevisan 1842-1890

Between the years 1842 and 1890 Trevisan proposed and for the most part validly published at least thirty-three new names for genera and subgenera of the bacteria. Some of these names have been accepted and have come into common use in bacteriology, others for one reason or another have

been ignored and not employed. The evaluation and appropriate disposition of these names from the standpoint of their legitimacy is an important problem. As an aid to its solution, Trevisan's "I Generi e le Specie delle Batteriacee" was photographically reproduced (1952). This paper was originally published as a separate brochure by the author; copies are rare (none known in America). The Editorial Board (1953) discussed the status of the several generic names proposed by Trevisan, and suggested a series of draft proposals as to their disposition. The Judicial Commission was asked to review these proposals and as far as practicable to fix the present status of each of the names. The Commission has placed the names in four groups. Those that can be adequately identified, have priority, and are in current use, are placed in the list of generic names to be conserved. Those that are later synonyms or homonyms are listed as illegitimate. Those that cannot be identified with reasonable definiteness are placed in the list of rejected generic names. The status of two names is left indeterminate and as requiring more study. The Judicial Commission at its meeting of 5th September 1953 approved the following Opinion.

Opinion 13.

1. Generic names proposed by Trevisan placed in the list of conserved generic names (nomina generum conservanda).

Generic Names	Type Species
Beggiatoa Trevisan 1842 (p. 56)	Beggiatoa alba (Vaucher) Trevisan 1845 (Oscillaria alba Vaucher 1803)
Klebsiella Trevisan 1885 (p. 105)	Klebsiella pneumoniae (Schroeter) Trevisan 1887. (Bacterium pneumoniae crouposae Zopf 1885)
Kurthia Trevisan 1885 (p. 92)	Kurthia zopfii (Kurth) Trevisan 1885. (Bacterium zopfii Kurth 1883)
Leptotrichia Trevisan 1879 (p. 138)	Leptotrichia buccalis (Robin) Trevisan 1879. (Leptothrix buccalis Robin 1853)

Neisseria Trevisan 1885 (p. 105)	Neisseria gonnorrhoeae Trevisan 1885.
Pasteurella Trevisan 1887 (p. 94)	Pasteurella cholerae gallinarum Trevisan 1887.

2. Generic names proposed by Trevisan placed in list of rejected generic names (nomina generum rejicienda).

Babesia Trevisan 1889 (p. 29)	Babesia xanthopyretica Trevisan 1889. (Streptococcus xanthopyreticus Trevisan 1887)
Bacteriopsis Trevisan 1885 (p. 103)	Bacteriopsis rasmussenii Trevisan 1885. (Leptothrix I Rasmussen 1883)
Billetia Trevisan 1889 (p. 11)	Billetia laminariae (Billet) Trevisan 1889. (Bacterium laminariae Billet 1888)
Cenomesia Trevisan 1889 (p. 1039)	Cenomesia albida Trevisan 1889
Cornilia Trevisan 1889 (p. 21)	Cornilia alvei (Flügge) Trevisan 1889. (Bacillus alvei Flügge 1886)
Dicoccia Trevisan 1889 (p. 26)	Dicoccia glossophila Trevisan 1889.
Eucornilia Trevisan 1889 (p. 21) (Subgenus)	Cornilia (Eucornilia) alvei Trevisan 1889. (Bacillus alvei Cheshire and Cheyne 1885)
Eumantegazzaea Trevisan 1889 (p. 942) (Subgenus)	Mantegazzaea (Eumantegazzaea) cienkowskii Trevisan 1879.
Eupacinia Trevisan 1889 (p. 23) (Subgenus)	Pacinia (Eupacinia) putrifica Trevisan 1889. (Bacillus putrificus coli Flügge 1886)
Euspirillum Trevisan 1879 (p. 24) (Subgenus)	Spirillum (Euspirillum) undula (Mueller) Ehrenberg 1830. (Vibrio undula Mueller 1773)
Leptotrichiella Trevisan 1889 (p. 935) (Subgenus)	Leptotrichia (Leptotrichiella) amphibola Trevisan 1889
Mantegazzaea Trevisan 1889 (p. 137)	Mantegazzaea cienkowskii Trevisan 1879.
Octopsis Trevisan 1885 (p. 102)	Octopsis cholerae gallinarum Trevisan 1885. (Micrococcus cholerae gallinarum Zopf 1885)

Generic Names	Type Species
Perroncitoa Trevisan 1889 (p. 29)	Perroncitoa scarlatinosa (Trevisan) Trevisan 1889. (Micrococcus scarlatinosus Trevisan 1879)
Pleurospora Trevisan 1889 (p. 22) (Subgenus)	Cornilia (Pleurospora) tremula (Koch) Trevisan 1889. (Bacillus tremulus Koch 1877)
Pseudospira Trevisan 1889 (p. 23) (Subgenus)	Pacinia (Pseudospira) choleraeasiaticae Trevisan 1885. (Vibrio cholerae Pacini 1854)
Pseudospirillum Trevisan 1889 (p.25)(Subgenus)	Spirillum (Pseudospirillum) amphibolum Trevisan 1889

3. Trevisan's generic names which, as later homonyms or synonyms, are regarded as illegitimate.

Bollingera Trevisan 1889 (p. 26)	Bollingera equi (Rivolta) Trevisan 1889. (Zoogloea pulmonis equi Bollinger 1870)
Rasmussenia Trevisan 1889 (p. 930)	Rasmussenia buccalis (Robin) Trevisan 1889. (Leptothrix buccalis Robin 1853)
Schuetzia Trevisan 1889 (p. 29)	Schuetzia poelsii Trevisan 1889. (Streptococcus equi Sand and Jensen 1888)
Winogradskya Trevisan 1889 (p. 12)	Winogradskya ramigera (Itzigsohn) Trevisan 1889. (Zoogloea ramigera Itzigsohn 1867)

4. Trevisan's generic names whose status is indeterminate.

Gaffkya Trevisan 1885 (p. 105)	Gaffkya tetragena (Gaffky) Trevisan 1885. (Micrococcus tetragenus Gaffky 1883)
Pacinia Trevisan 1885 (p. 83)	Pacinia cholerae asiaticae Trevisan 1885.

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Opinion 14

Names of Bacterial Genera to be Rejected as later Synonyms of Names of Genera of Protozoa

Becker (1951) listed the generic homonyms in bacteriology and protozoology. He found that ten bacterial generic names proposed (one of them, Astasia, independently for two different bacterial genera) are later homonyms of names of protozoan genera. He suggested that these bacterial generic names should be rejected in bacteriology. The Editorial Board (1953) proposed that these names be considered by the Judicial Commission for possible inclusion in the list of names of bacterial genera to be rejected. The proposal has been considered by the Judicial Commission and the following Opinion approved.

Opinion 14.

The following names proposed for bacterial genera are found to be later homonyms of names applied to genera of protozoa. Rule 24 of the International Code of Bacteriological

Nomenclature states that such later homonyms are illegitimate in bacteriology. These names are to be placed in the list of names of bacterial genera to be rejected (*nomina generum bacteriorum rejicienda*).

Rejected Names of Bacterial Genera	Names of Protozoan Genera Having Priority
Astasia Meyer 1897	*Astasia* Ehrenberg 1830
Astasia Pribram 1929	
Castellanella Pacheco and Rodriques 1930	*Castellanella* Chalmers 1918
Charon Holmes 1948	*Charon* Karsch.1879
Coccomonas Orla-Jensen 1921	*Coccomonas* Stein 1878
Listerella Pirie 1927	*Listerella* Jahn 1906
Palmula Prévot 1938	*Palmula* Lea 1833
Pfeifferella Buchanan 1918	*Pfeifferella* Labbé 1899
Phytomonas Bergey et al. 1923	*Phytomonas* Donovan 1909
Rhizomonas Orla-Jensen 1909	*Rhizomonas* Kent 1880
Rhodosphaera Buchanan 1918	*Rhodosphaera* Haeckel 1881

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STATUS OF THE GENERIC NAMES ESCHERICHIA, KLEBSIELLA, AEROBACTER, AND CLOACA

Preliminary Statement

Editorial Board

Cowan (1954) has reviewed the status of certain generic names of coliform bacteria (the Enterobacteriaceae). He pointed out that the rejection of Bacterium (Opinion 4 rev.) as a generic name in bacteriology makes imperative the consideration of the legitimacy of certain generic and specific names in common use, names in some cases which are later synonyms and hence illegitimate. However, current usage can be made legitimate by agreement and through use of the international mechanisms set up for consideration of questions of this nature.

The following proposals based upon Cowan's analysis have been prepared for consideration by those interested, and particularly by the members of the International Committee on Bacteriological Nomenclature. Comments, criticisms, and suggestions are solicited from all interested bacteriologists; such should be sent either to one of the two permanent secretaries, or to the Chairman of the Judicial Commission. The columns of the BULLETIN are open for the publication of pertinent communications relative to the proposals. All comments will be considered by the Judicial Commission and Opinion issued, which Opinion will be authoritative unless challenged and an appeal taken to the International Committee.

In any consideration of these proposals, the limitations of the term conservation should be kept clearly in mind. For example, in the following draft proposals the generic name Klebsiella published in 1885, the name Escherichia published in 1919 and Aerobacter published in 1900 are proposed for conservation. Each has its type species designated. Should an author conclude that the differences between the genera Klebsiella and Aerobacter or between Aerobacter and Escherichia were not sufficient to justify their segregation, he would be justified in uniting the two genera and using the name of the genus having priority in spite of the conservation of the second generic name.

DRAFT PROPOSALS

Draft Proposal 1. The generic name Escherichia Castellani and Chalmers 1919 shall be placed in the list of conserved bacterial generic names (nomina generum conservanda).

Draft Proposal 2. The type species of the genus Escherichia is Escherichia coli (Migula) Castellani and Chalmers 1919 (Bacterium coli commune Escherich 1885). The specific epithet coli in the species name Escherichia coli is conserved.

Draft Proposal 3. The generic name Aerobacter Beijerinck 1900 shall be placed in the list of conserved bacterial generic names (nomina generum conservanda).

Draft Proposal 4. The type species of the genus Aerobacter is Aerobacter aerogenes (Kruse) Beijerinck 1900 (Bacterium lactis aerogenes Escherich 1885). The specific epithet aerogenes in the species name Aerobacter aerogenes is conserved.

Draft Proposal 5. The generic name Klebsiella Trevisan 1885 shall be placed in the list of conserved bacterial generic names (nomina generum conservanda).

Draft Proposal 6.

Alternative 1. The type species of the genus Klebsiella is Klebsiella pneumoniae (Schroeter) Trevisan 1885 (Bacterium pneumoniae crouposae Zopf 1885). The specific epithet pneumoniae in the species name Klebsiella pneumoniae is conserved.

Alternative 2. The type species of the genus Klebsiella is Klebsiella friedlaenderi Trevisan 1889 (Bacterium pneumoniae crouposae Zopf 1885). The specific epithet friedlaenderi in the species name Klebsiella friedlaenderi is conserved.

Draft Proposal 7. The generic name Cloaca Castellani and Chalmers 1919 shall be placed in the list of conserved bacterial generic names (nomina generum conservanda).

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THE BACTERIAL GENERIC NAMES MICROCOCCUS AND STAPHYLOCOCCUS

Preliminary Statement

Editorial Board

The Judicial Commission early had as its File No. 23 (1951) a request for an Opinion relative to the desirability of conserving the generic name Micrococcus Cohn 1872 and fixing the type species and type strain. A similar request was filed with reference to the generic name Staphylococcus Rosenbach 1884. Breed (1952) noted that the Winslows (1909) designated Micrococcus flavus Trevisan 1889 as the type species of the genus Micrococcus. However, this species was not included in the original publication of the generic name Micrococcus Cohn 1872. Buchanan (1917) designated Micrococcus luteus (Schroeter) Cohn 1872 as the type. Breed (1952) reviewed the history of M. luteus and concluded that this species could be identified and was correctly designated as the generic type. Shaw, Stitt, and Cowan (1951) suggested that the generic name Staphylococcus Rosenbach 1884 be conserved against Micrococcus Cohn 1872 with the type species S. aureus Rosenbach 1884. These latter authors emphasized that the generic name Staphylococcus was almost universally used by medical bacteriologists, and that the conservation of Micrococcus would cause much confusion and misunderstanding. Gibson (1953) requested an Opinion. He adduced evidence that the type species Micrococcus luteus Cohn 1872 can not be identified and that no cultures are known which conform to Cohn's description. The generic name Micrococcus, he argued, is illegitimate because no example conforming to the description of its type species can be found, hence Micrococcus should be replaced by Staphylococcus Rosenbach.

Breed (1952) states that the American Type Culture Collection No. 398 has the characters "that agreed with the characters given in Schroeter's original description of the organism." Gibson (1953), on the other hand, states quite categorically: "Apparently under the rules this proposal must also be rejected because ATCC No. 398 does not possess one of the few known characters of M. luteus Cohn, the ability to grow in a tartrate-NH_3-salts solution."

Breed (in correspondence) states that repeated tests of ATCC No. 398 have shown that it will grow in ammonium tartrate agar, as well as on other media in which the ammonium ion is the sole source of nitrogen, provided a suitable source of carbon is available. Breed and Gibson are in agreement that S. aureus Rosenbach will not grow on such media.

Final agreement on the characters of M. luteus (Schroeter) Cohn should be possible. It seems advisable, however, to issue this preliminary statement in order to invite discussion and contributions from microbiologists interested. Consideration may be given to the following attempt to focus the issues.

1. Is Micrococcus luteus (Schroeter) Cohn a recognizable species with a culture available as a type (or standard) culture? If this designation of the type species of the genus Micrococcus is confirmed, there would remain no reason to deny the valid publication of the generic name Micrococcus Cohn.
2. If the generic name Micrococcus Cohn is validly published, it may be well to conserve it so that no prior synonyms may be urged against it.
3. If the generic name Micrococcus is conserved, the type species would be Micrococcus luteus (Schroeter) Cohn. A type culture should be selected by a committee of experts. One suitable culture has been suggested by Breed.
4. The type culture should have the characters listed by Schroeter:-
    a) Yellow pigment.
    b) Ability to utilize ammonium tartrate as the sole source of nitrogen and carbon.
5. The genus Staphylococcus Rosenbach 1884 has as its type species Staphylococcus aureus Rosenbach 1884. The species name is quite generally recognized. There seems to be general agreement as to the validity of publication by Rosenbach of the generic and species names.
6. It may be desirable to conserve the generic name Staphylococcus Rosenbach, with definite designation of the type species and of a type culture. The latter should be selected by a committee of experts. A type culture has been suggested by Cowan, Shaw and Williams (1954). It should have the characters as listed by Rosenbach.

7. Confusion in microbiological literature has arisen in the past because of the use of Micrococcus and Staphylococcus rather interchangeably. Both are generic names found in the medical literature, Staphylococcus predominantly. Both are also found in the nonmedical literature, probably Micrococcus more commonly. There seems to have been the tacit assumption by many workers that Micrococcus and Staphylococcus constitute two differentiable genera, but satisfactory differential criteria have not been definately fixed. It is possible that the marked differences in nitrogen metabolism between the two type species may make generic differentiation practicable.
8. If both generic names, Micrococcus Cohn and Staphylococcus Rosenbach are conserved, what happens if an author does not wish to recognize that there is any adequate basis for differentiation of two genera? He places all the species in the genus Micrococcus. If he desires to recognize Staphylococcus as the all inclusive generic name, it becomes necessary that Staphylococcus Rosenbach be conserved against Micrococcus Cohn.

The proposals relate to generic names that are widely used. Comments and suggestions are asked of all interested before formulation of definite proposals for an Opinion are submitted to the Judicial Commission.

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AMENDMENTS TO THE INTERNATIONAL CODE OF NOMENCLATURE OF THE BACTERIA AND VIRUSES (BACTERIOLOGICAL CODE)

Editorial Board

The Editorial Board and Judicial Commission were requested, at the meeting of the International Committee on Bacteriological Nomenclature in Rome, September 1953, to edit and publish as soon as practicable an official revised international code of nomenclature. It was unanimously agreed that the name of the code should be changed from the "International Bacteriological Code of Nomenclature" to the "International Code of Nomenclature of the Bacteria and Viruses", with "Bacteriological Code" as a short title. Many amendments and revisions of the code were approved. These changes may be identified by comparing several publications, including the original printing of the International Code (1) in 1948, the "Proposals Relative to Emendation and Publication" (2) prepared by the Editorial Board in 1953, the Minutes of the Judicial Commission (3) of September 1953, and the Minutes of the International Committee of Bacteriological Nomenclature (4) of September 1953. Some amendments and revisions approved at the Rio de Janeiro Congress in 1950 are to be included (5). Inasmuch as the preparation of the official code for publication will require several months, it has seemed wise to publish a synopsis of the revisions so that those who wish may refer to the amended code. The revisions only are included in the synopsis. In several cases where the amendments are long and readily accessible in issues of this Bulletin they have been cited but not reprinted.

SYNOPSIS OF AMENDMENTS AND REVISIONS OF THE INTERNATIONAL CODE OF NOMENCLATURE OF BACTERIA AND VIRUSES (BACTERIOLOGICAL CODE)

CHAPTER 1

General Considerations and Definitions

General Considerations 1, 2, and 3. No change.

CHAPTER 2

General Principles and Definitions

Principles 1, 2, and 3. No change.

Principle 4. The first sentence was amended to read: Scientific names of all taxonomic groups (taxa) are usually taken from Latin or Greek.

Principle 5. Revised as follows:- Nomenclature deals with
1. The terms which denote the categories of taxonomic groups or units (such as species, genus, family, order) and the relative ranks of these categories.
2. The names which are applied to the individual taxonomic groups (such as Bacillus subtilis, Streptococcus, Spirillaceae, Spirochaetales).

Note 1. The use of the word taxon (plural taxa) is appropriate for the term taxonomic group or the word group wherever used in the sense of taxonomic group in this Bacteriological Code. The word group has as its preferred use in bacteriology that indicated in Recommendation 8a.

Note 2. As used in this code, the word name means a name that has been validly published, whether legitimate or illegitimate.
A legitimate name or epithet is one that is in accordance with the rules.
An illegitimate name or epithet is one that is contrary to the rules.

The correct name of a taxon with a particular circumscription, position and rank is the name which must be adopted for it under the rules.

A name is effectively published when its publication is in accordance with Rule 11.

A name is validly published when its publication is in accordance with Rules 12, 13, and 14.

Principle 6. No change.

Principle 7. Revised by insertion of the following statement as the first sentence in Principle 7.

Every individual is treated as belonging to a number of categories of consecutive rank and consecutively subordinate, of which species is the basic one.

Principle 8. No change.

Principle 9. Revised as follows:- Each order or taxon of lower rank, with a given circumspection, position and rank, can bear only one correct name, the earliest that is in accordance with the Bacteriological Code. Provision is made for exceptions that have been approved for inclusion in the list of nomina conservanda.

Note. In subgenera, genera and taxa of higher rank, the correct name is the earliest name published, provided that this is in conformity with the rules of the Bacteriological Code. In species the correct name is the binary and in subspecies the ternary combination of the generic name with the earliest available epithet or epithets published with the same rank.

Principle 10. No change.

Principle 11. Revised as follows;- The application of the names of taxonomic groups (taxa) is determined by means of nomenclatural types. A nomenclatural type is that constituent element of a taxonomic group (taxon) to which the name of the group is permanently attached.

Note. The nomenclatural type is not necessarily the most typical or representative element of a group. It is merely that element with which the name of the group is permanently associated.

Principle 12. No change.

CHAPTER 3

Rules of Nomenclature with Recommendations

Section 1

Naming of Taxonomic Groups (Taxa) of Various Ranks

Rule 1. Revised as follows:-
The names of taxonomic groups (taxa) above the rank of genus are substantives or adjectives used as substantives, of Greek or Latin origin, or latinized words, in the plural number.

Rule 2. Revised as follows:-
Names of taxonomic groups (taxa) above the rank of family are taken preferably from a combination of characters covering the nature of the taxa as closely as possible, or from a single character of outstanding importance.

Recommendation 2a. Names of new orders and suborders should preferably be based upon the name of a contained family.

Rule 3. Revised as follows:-
Names of taxonomic groups (taxa) between subclass and genus are formed by the addition of the appropriate suffix to the stem of the type genus.

Rule 4. Revised as follows:-
Names of taxonomic groups between subclass and genus have suffixes to fix the taxonomic rank. The suffix for orders is -ales, for suborders is -ineae, for families -aceae, for subfamilies -oideae, for tribes -eae, and for subtribes -inae.

Rule 5. The last sentence of the first paragraph revised as follows:-
Generic names and subgeneric names are subject to the same rules and recommendations, and, from a nomenclatural standpoint, they are coordinate, except that citations of authors and dates are governed by Rule 16.

Rules 6, 7, and 8. No change.

Section 2

Designation of Nomenclatural Types

Rule 9. Revise as follows:-

For each taxonomic group there shall be designated a nomenclatural type. The type of a class or a subclass is an order, that of an order or a suborder is a family, that of a family, subfamily, tribe, or subtribe is a genus, that of a genus or subgenus is a species, that of a species or a subspecies is an authentic culture*, specimen, preparation, illustration, or description.

(1). Nomenclatural types of taxa of higher rank than genus

The nomenclatural type of a family, subfamily, tribe, or subtribe, whose name has been formed in conformity with the Rules and Recommendations is that genus from whose name the name of the higher taxon has been derived. The nomenclatural type of a taxon of rank higher than family may be fixed at the time of its proposal by the author. If not so fixed, it may be designated by the Judicial Commission.

(2) The nomenclatural types of genera and subgenera.

a. The nomenclatural type of a genus or subgenus is the species or one of the species included when the name of the genus or subgenus was originally validly published.

b. If the author in the original publication of a generic or subgeneric name definitely selected a type species, this species shall be accepted as the type regardless of other considerations (type selection by original designation). The meaning of the expression "selected a type species" is to be rigidly construed. Mention of a species as an illustration or example of a genus does not constitute selection of a type.

c. If the author of a generic or subgeneric name in his

*Culture is to be interpreted as including every method of maintaining organisms in a living state (in a medium, in a host by passage, in cells or exudates, or desiccated).

original publication failed to designate a type species, the type may be selected by a subsequent author, and the author who first makes the choice must be followed unless it can be proved that his choice is not in accordance with the rules.

(i) If the genus when originally published included but one species, this species shall be the type (selection by monotypy).

(ii) If the genus when originally published included more than one species, the type species selected shall be one of these. However, species inquirendae, species doubtfully referred to the genus, species mentioned as in any way exceptional, species which definitely disagree with the generic description (provided others agree), and species which possess characters stated in the generic description as rare or unusual are to be excluded from consideration in selecting the type.

(iii) If none of the species named by an author in his original description and publication of a generic name can be recognized, that is, if no identifiable type species can be selected in accordance with the rules, the Judicial Commission may issue an Opinion declaring such generic name to be a nomen rejiciendum and without standing in nomenclature. However, if such generic name has come into use for identifiable species named subsequently, one of these later species may be selected by international agreement as the type with the generic name ascribed to the author of the binomial designated as the type. Such selection of a type and recognition of the author of the generic name must be based upon an Opinion by the Judicial Commission, and if such Opinion is questioned, its validity shall be determined by action of the International Committee on Bacteriological Nomenclature.

(iv) The publication of a new generic name as an avowed substitute for an earlier one does not change the type of the genus.

(3) The nomenclatural types of species and of infra-specific taxa.

Recommendation 9a. Nomenclatural types of bacterial species obviously cannot be the dried or preserved specimens used for higher plants or animals. A type may be either a living culture* maintained in a bacteriological laboratory, more particularly in one of the national type culture collections, or it may be a description.

Definition. A type culture is a living culture of an organism which is a descendant of the original culture or isolation from which the author who first described the organism made his original description, which culture has been maintained pure, and which agrees in the characters with the original description. Authors of names of species or of infra-specific taxa are urged to deposit authentic cultures with one or more of the national type culture collections and thus make them available to other workers for comparison.

Definition. A neotype culture (or substitute type culture or standard culture) is one which has been accepted by international agreement to replace a type culture which is no longer in existence. Its diagnosis should agree with that given by the original describer and should be recommended by at least three separate workers familiar with the species, and their agreed recommendations approved by the Judicial Commission. For species which cannot be maintained in laboratory cultures* or for which neither type culture of substitute type cultures exist, the type is the original description, preparation or illustration.

Recommendation 9b. When publishing the name of a new taxonomic group (taxon), authors should indicate carefully the nomenclatural type of the taxon being named. This type determines the application of the name in the event of this taxon being subsequently divided.

Recommendation 9c. The utmost importance should be given to the preservation of the original "type" material on which the descriptions of new species and subspecies are based. If the microorganism is one which may be

*See footnote page 171.

maintained in pure culture, an authentic culture designated as the type culture should be deposited with one or more of the national or international type culture collections. When such a culture is not available, a substitute type culture may be designated by the Judicial Commission. Bearing in mind the morphological, biochemical, antigenic, and virulence changes that may occur as the result of repeated subculture, every precaution should be taken to maintain such cultures with a minimum amount of change. It is likewise important that descriptions, illustrations, and differentiations of new species be as complete as possible.

Section 3

Publication of Names

Rule 10. Revised as follows:- Valid publication is treated as beginning for the bacteria with May 1, 1753, the date of publication of Linnaeus' Species Plantarum, edition 1.

Note. This date was fixed by action of the first International Congress of Microbiology at its plenary session in Paris, 1930.

Rule 11. No change.

Rule 12. First paragraph revised to read as follows:-
A name of a taxonomic group (taxon) is not validly published unless it is both (1) effectively published (see Rule 11), and (2) accompanied by a description of the taxon or by a reference to a previously and effectively published description of it.

Third paragraph revised to read as follows:-
Valid publication is not effected by placing a name on a culture or preparation of bacteria in a collection or exhibit open to the public.

Fourth paragraph revised and note added as follows:-
A name (1) which is not accepted by the author who published it, or (2) which is merely proposed in anticipation of the future acceptance of the taxonomic group concerned, or of a particular circumscription, position, or rank of

the taxon, or (3) a name merely mentioned incidentally is not validly published.

Note. Number (1) does not apply to names or epithets published with a question mark or other indication of taxonomic doubt, yet published and accepted by the author. By "incidental mention" of a new name or combination is meant mention by an author who does not intend to introduce the new name or combination concerned.

Sixth paragraph revised as follows:-
The name of a taxon is not validly published by the mere mention of the subordinated taxa included in it.

Recommendation 12d. An author who describes and names a new taxon should indicate the name and rank of the next higher taxon.

Recommendation 12e. An author of a new name should clearly indicate the rank of the taxon concerned.

Recommendation 12f. An author when publishing the name of a new taxon should designate the type and, in the case of a species or subspecies, the collection where the type strain or equivalent is preserved.

Recommendation 12g. An author when publishing new generic or subgeneric names should give their etymology and also that of new epithets when their meaning is not obvious.

Rule 13. Revised to read as follows:-
The name of a genus or subgenus is not validly published unless it is accompanied (1) by a description of the genus or subgenus, (2) by citation of a previously and effectively published description of the genus or subgenus, or (3) by a reference to a previously and effectively published description of the genus as a subdivision of a genus or by the description of the subgenus as a genus.

The name of a monotypic new genus based on a new spe-

cies is validly published if there is provided a combined generic and specific description.

Note. A description of a new species assigned to a monotypic new genus is treated also as a generic description if the genus is not described.

Similarly a description of a monotypic new genus based on a new species is treated also as a specific description if the generic name and specific epithet are published together and the species is not separately described.

Recommendation 13a. An author who gives a combined generic and specific description should mention the points in which the new genus differs from its allies.

Rule 14. Revised as follows:-
The name of a species or subspecies (variety) is not validly published unless it is accompanied (1) by a description of the species or subspecies, or (2) by the citation of a previously and effectively published description of it.

Section 4

Citation of Authors' Names

Rule 15. The second sentence of paragraph 2 becomes:-

Recommendation 15a. When the alteration of diagnostic characters or circumscription has been considerable, the nature of the change and the author responsible may be indicated by adding suitably abbreviated words such as emend. (emendavit), mutatis charact., excl. gen., excl. spec., etc.

Revise first part of first line of third paragraph of Rule 15 to read:-
When a name of a taxonomic group has been proposed but not validly published by one author . . . etc.

Add the following as paragraph 4 of Rule 15:-
Retention of a name in a sense which excludes the type can be effected only by conservation.

Note. See Provisions 4 and 5 for method of conserving names.

Recommendation 15b. When a name is conserved so as to exclude its type, it should not be ascribed to the original author with such expressions as emend., mutatis charact., etc.; but the name of the author whose concept is conserved must be cited as authority.

Paragraph 4 of Rule 15 is changed to a recommendation and rephrased as follows:-

Recommendation 15c. When a name with a description or reference to a description by one author is published in a work of another author, the word in should be used to connect the names of the two authors.

Rule 16. Add the following recommendations:-

Recommendation 16c. In the citation of a nomen nudum, its status should be indicated by adding nomen nudum (nom. nud.) to the citation.

Recommendation 16d. If a generic name antedated by one of its synonyms or by a homonym is valid on account of being a nomen conservandum; nom. conserv. should be added to the citation.

Recommendation 16e. Names cited in synonymy should be spelled exactly as published by their authors. If any explanatory words are required, these should be inserted in brackets. If a name is adopted as valid with alterations from the form as originally published, it is desirable that in full citations the exact original form should be appended.

Section 5

Changes in Names Resulting from Segregation or Union of Taxa

Rule 17. Revise paragraph 1 as follows:-

An alteration of the diagnostic characters or of the circumscription of a taxonomic group (taxon) does not warrant a change in its name, except as this may be necessitated (a) by transference of the taxon, (b) by its union with

another taxon of the same rank, or (c) by a change of its rank.

The name of a taxonomic group must be changed if the nomenclatural type of the taxon is excluded.

Rule 18. The first paragraph is rephrased as follows:-
When a species is divided into two or more species, the specific epithet must be retained for one of them, or (if it has not been retained) must be reinstated. When a type has been designated for the species, the specific epithet must be retained for the species including that type. When no type was designated, one should be chosen.

Rules 19, 20, 21, and 22. No change.

Section 6

Rejection and Replacement of Names and Epithets

Rule 23. Revised as follows:-
A legitimate name or epithet must not be rejected merely because it is inappropriate, or disagreeable, or because another is preferable or better known, or because it has lost its original meaning.

Rule 24. The first sentence revised to read as follows:-
If it is a later homonym of the name of a taxonomic group (taxon) of bacteria, plants, or protozoa; that is, if it duplicates a name previously and validly published for a taxon of the same rank based on a different type.

Section(5) of Rule 24 revised as follows:-
If it is used with different meanings and so becomes a long persistent source of error.

Rule 25. Revised as follows:-
A specific or infra-specific epithet is illegitimate in the following special cases and must be rejected:
(1) When it is merely a word not intended as a name.
(2) When it is merely an ordinal adjective used for enumeration.
(3) When it exactly repeats the generic name (tautonym).

(4) When it is a later homonym within the same genus; that is, when it duplicates a specific epithet previously and validly published for a species of the same genus based upon a different type.
(5) When it was published in a work in which the Linnaean system of binary nomenclature for species was not consistently employed.

Rule 26. The following sentence is appended:-
The epithet in the resultant combination is treated as new.

Section 7

Orthography and Gender of Names and Epithets.

Rule 27. Revised as follows:-
The original spelling of a name or epithet must be retained, except typographic or orthographic errors. When two or more generic names, or two or more specific epithets in the same genus, are so similar as to cause confusion, they are treated as orthographic variants of the same name or epithet.

Note 1. The phrase "original spelling" as used in this rule means the spelling employed when the name of the taxon was validly published. It does not refer to the use of an initial capital or small letter. Adjectives used as specific or subspecific epithets change gender endings when necessary to agree with the gender of the generic name.

Note 2. The use of a wrong connecting vowel or vowels (or the omission of a connecting vowel) in a generic name or in a specific or subspecific epithet gives rise to orthographic variant. (See Rec. 27h).

Note 3. When there is doubt as to whether two names or epithets are sufficiently alike to be confused, they should be referred to the Judicial Commission for an Opinion.

Note 4. An unintentional orthographic error later corrected by the author is to be recognized as legitimate in its corrected form.

Note 5. The name of a taxon derived from the Greek but

not transliterated by its author in accordance with approved standards may be corrected, the name of the taxon as originally published becomes an orthographic variant of the corrected name, but without prejudice to the validity of publication by the first author. Specific and other epithets and names of Greek origin differing merely by having Greek and Latin terminations respectively are orthographic variants. Epithets having the same meaning and differing only slightly in form are considered as orthographic variants. The genitive and adjectival forms of a personal name are, however, treated as different epithets.

Note 6. The liberty of correcting a name or epithet must be used with reserve, especially if the change affects the first syllable, and above all the first letter, of the name or epithet.

Note 7. (New). Names of taxa and specific epithets are often compound words, sometimes formed from Latin stems, more often from Greek stems, sometimes (less correctly) from stems from two different languages. Compound words formed from the same stems may differ only in the connecting vowels.

a. In the formation of compound names of taxa and of specific epithets from the Latin the preferred connecting vowel is i. Such compound names differing in spelling only by having the connecting vowel i or o are to be regarded as orthographic variants. Names of taxa which are such orthographic variants and based upon different types are to be regarded as homonyms. The spelling for each taxon or specific epithet should be that used by the author when the compound was validly published.

b. The combining vowel in Greek compounds in which the first component is a noun (substantive) or adjective, is usually o. It may be omitted if the second component begins with a vowel. It is omitted when the first component ends in y, e.g. glycyphyllus. Another combining vowel may be used if there is good Greek precedent, e.g. as in Corynebacterium.

Names of taxa or of specific epithets which are Greek compounds and differ only in the presence or absence of the combining vowel o, or have another combining vowel, are to be regarded as orthographic variants. If the names are based upon different types they are to be regarded as homonyms. The correct spelling is that used by the author of the name in its initial and valid publication.

c. Compound words derived from two or more languages (nomina hybrida) are to be regarded as orthographic variants if they differ only in the combining vowel. If the two compounds are names of taxa having different types they should be regarded as homonyms. The spelling first used by an author in the valid publication of a name should govern.

Recommendation 27a. Revised as follows:-
When a new name or epithet for use in bacteriological nomenclature is derived from a Greek word, the transcription to Latin form should conform to classic usage. To assist authors of such new names and epithets in interpreting good usage, Appendix A to this Code may be used as a guide. If a later author corrects the spelling of a name or epithet incorrectly transliterated from the Greek, the correctly spelled word may be regarded as a legitimate orthographic variant of the name or epithet.

Recommendation 27c. Add to 27c (1).
In latinized names ending in -us, this termination is dropped before adding the suffix.

At the end of third sentence of 27c (4) insert:-
the Scandinavian ø (ö), ae (ä) and å become oe, ae, and aa.

Recommendation 27d. Revised as follows:-
Add to the first paragraph:
The Scandinavian ø (ö), ae (ä) and å become oe, ae, and aa.

The second paragraph revised to read:-
When the epithet is a substantive, the modern latinized genitive is formed in the following manner:

(1) When the name of the person ends in a vowel or y, the letter i is added (thus, sonnei from Sonne) except where the name ends in a, when e is added (thus, balansae from Balansa).

(2) When the name ends in a consonant, the letters ii are added, except when the name ends in er, when i is added. Specific epithets which do not conform to this recommendation may be corrected.

(3) When the personal name is already Latin or Greek or has been latinized the appropriate Latin genitive should be used.

Recommendation 27h. Replace former Recommendation 27h with the following:-
When it is necessary to choose between words which have been validly published as names of taxa or as specific epithets and which differ in spelling only because of faulty or alternative spelling of Latin words, or because of faulty or alternative transliterations of Greek to Latin, or because of alternative transfer of endings denoting gender or oblique cases (particularly the genitive) from Greek to Latin, it is recommended that choices be governed by the provisions of Appendix B to this Code, q.v.

Recommendation 27j. (New).
Words transliterated and latinized from languages that do not use the Latin alphabet are to be regarded as orthographic variants if they differ only in the transliteration. Such orthographic variants used as names of taxa based upon different types are to be regarded as homonyms.

Recommendation 27k.
Names of taxa and specific epithets differing only in presence or suppression of diacritical marks, transliteration of the German umlaut or the use of special letters are to be regarded as orthographic variants and, when based upon different types, they should be treated as homonyms. Words not formed in conformity with Recommendation 27c and 27d may be corrected.

Recommendation 27 1
A name or epithet from a non-Latin or a non-Greek word which does not have an ending conforming to that of one of the Latin declensions and which has not been latinized by the addition of a Latin ending shall be regarded as a non-declinable Latin noun.

Recommendation 27m.
Authors of new names of taxa or of new specific or infraspecific epithets derived from the Greek are urged to transliterate Greek words or stems into Latin form by adherence to the recommendation of Appendix A, q.v.

Rule 28. Paragraph 2 revised to read as follows:-
Generic and subgeneric names which are modern compounds formed from two or more Greek or Latin words take the gender of the last. If the ending is altered, the gender is that of the new ending in the language of origin.

CHAPTER 4

Provisions for Exceptions to the Rules and for the Interpretation and Modification of the Rules

At the 1950 meeting of the International Committee of Bacteriological Nomenclature this Chapter 4 was extensively revised. This is not here repeated because of its length. The Revision may be found in this BULLETIN 1:27-32, 1951. References to revision are to the 1950 amendments to the code.

Provision 4. Insert after the second paragraph:
If a member of the International Committee on Bacteriological Nomenclature cannot attend the meetings of the Committee, an alternative having all of the rights of an appointed member, except in the election of officers and commissioners, will be chosen in accordance with the following provisions:-

1. The national microbiological society which the member represents shall have the right to nominate an alternate.

2. If no nomination is made by the national society, the

member himself shall have the right to nominate an alternate.

3. If neither the national society nor member nominates an alternate, the Chairman of the Committee with the Permanent Secretaries may nominate.

All nominations for alternates by national societies or by members shall be in writing, and should be in the hands of one of the Permanent Secretaries before the first meeting of the Committee.

All nominations for alternates shall be presented at the first meeting of the Committee, and nominees elected by vote of the Committee will serve as alternates.

Provision 4, Section B, Subsection 8 revised as follows:-
One or other of the Permanent Secretaries shall be designated a member of each subcommittee and shall be responsible only for advising the specialist subcommittee on the interpretation of the Bacteriological Code.

Provision 4, Section E. To be added:-
Taxonomic subcommittees of experts authorized by Provision 4, Section C, subsection 4, shall work under the following rules:-

1. The chairman and secretary shall be elected by members of the subcommittee, and shall hold office for six years. After holding office they shall be eligible for reelection.

2. Ordinary members of the subcommittee shall be appointed by the International Committee. Between congresses, the chairman and secretary, acting in agreement, may co-opt as temporary members specialists who can contribute substantially to the work of the subcommittee. At the next congress the names of temporary members shall be submitted to the International Committee, which shall determine whether they shall become ordinary members.

3. One of the secretaries of the International Committee

shall be an ex-officio member of each subcommittee, but shall not have voting powers.

4. Each subcommittee shall meet at each International Congress and shall review its membership. The names of members who have retired, or have ceased to interest themselves in the work of the subcommittee, or who have died, shall be deleted from the membership list. The subcommittee shall, if it desires, replace the inactive members by more active experts, but it is not essential to maintain the membership at a definite number.

5. The chairman and secretary of each subcommittee will be jointly responsible for the presentation of a report to the International Committee. This report, if approved by the International Committee, will be published in the International Bulletin of Bacteriological Nomenclature and Taxonomy. The report should be accompanied by an up-to-date list of names and addresses of members of the subcommittee.

6. A subcommittee may create one or more subgroups to study particular problems. Each subgroup shall have a chairman appointed by the subcommittee. At least two-thirds of the members of each subgroup shall be appointed by the subcommittee, but need not themselves be members of the subcommittee; up to one-third may be co-opted as experts, at the invitation of the subgroup chairman.

7. When votes are called for in subcommittees or subgroups a simple majority shall suffice; in the event of a tie the chairman shall have a second or casting vote. If members wish to record a unanimous decision, a fresh vote may be called for. Votes shall be recorded by a show of hands unless a secret ballot is demanded by at least one-quarter of the members present.

8. Members who cannot attend meetings of subcommittees may send alternates to act for them. An alternate should be provided by the member with a written authority which will entitle him to record a vote on the member's behalf. Expert observers may be introduced by members but do not have voting rights.

9. Between congresses the work of the subcommittees will be conducted by correspondence; when votes are called for, each ballot paper will be signed by the member, unsigned papers will not be counted.

Provision 5. Insert the following the first paragraph:-
If a Commissioner cannot attend the meetings of the Judicial Commission, an alternate having all of the rights of a Commissioner, except in the election of Officers, will be chosen in accordance with the following provisions:-

a. The Commissioner himself shall have the right to nominate an alternate.

b. If no nomination is made by the Commissioner, the Judicial Commission will elect an alternate from members of the Congress, preferably members of the Committee on Bacteriological Nomenclature.

All nominations shall be in writing and in the hands of the Chairman of the Judicial Commission before the first meeting of the Commission. All nominations for alternates shall be presented at the first meeting of the Commission and nominees elected by vote of the Commission will serve as alternates.

Provision 5-B-2. Insert between first and second sentence:-
A request for an Opinion should be accompanied by a fully documented statement of the relevant facts; when a request is not supported by adequate evidence it shall be returned to the sender for revisions. When an Opinion is challenged, the basis of the challenge shall be stated and supported by a documented statement of the relevant facts.

Provision 5-B-5. Add at the end of the first sentence:-
and a list of preferred spellings of names of taxa and specific epithets.

Appendix A giving the approved method of transliterating Greek words for use in Nomenclature in Microbiology was approved. This is not here reprinted. See this Bulletin 3: 65-69, 1953.

Appendix B giving Alternative Spellings of Names and Epithets in Microbiology and discussing Orthographic Variants (See this Bulletin 3:70-72, 1953) was approved with the following revision:-

To the last sentence of the first paragraph of Appendix B add the following:-
Correction of spellings of existing names authorized by this appendix should be approved by the Judicial Commission and included in the list of preferred spellings (Prov. 5-B-5).

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(1) Buchanan, R.E., Ralph St. John Brooks, and Robert S. Breed. International Bacteriological Code of Nomenclature. J. Bact. 55:287-306. 1948.

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(3) Joint Secretaries. Minutes of the Judicial Commission Meetings held at Rome in connection with the VI International Congress for Microbiology, September, 1953. Ibid. 3(4):141-154. 1953.

(4) ____ Minutes of Meetings of the International Committee on Bacteriological Nomenclature held at Rome in connection with the VI International Congress for Microbiology. September, 1953. Ibid. 3(4):155-162. 1953.

(5) Buchanan, R. E., Robert S. Breed, and S. T. Cowan. Authorization of a Committee on Bacteriological Nomenclature and of a Judicial Commission. Ibid. 1(1): 27-32. 1951.

(6) Editorial Board. Transliteration of Greek words for use in nomenclature in microbiology. Ibid. 3(2,3):63-69. 1953.

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SOME RUSSIAN CONTRIBUTIONS TO TAXONOMY AND NOMENCLATURE OF THE VIRUSES

A Review

Robert S. Breed and A. Petraitis
New York State Experiment Station,
Geneva, New York, USA.

Zhdanov, V.M. Opredelitel' Virusov Celovska i Zivotmych (Guide to the Human and Animal Viruses). Izdalestro Akademii Medicinskich Nauk. USSR. Moskau 1953. Publisher Acad. Med. Sci. USSR, Moscow, 1953 (June 9) 348 pp.

The recent book by Zhdanov (1953) calls sharply to our attention the fact that in recent years there have appeared several Russian contributions relative to the classification and nomenclature of the viruses. The work of the Russian scientists is but poorly known outside Russia, largely because of difficulty in securing the literature. In a series of reports and books there is proposed new Linnaean nomenclature in classifications of rickettsias and viruses.

Zhdanov's treatise groups all of the rickettsias and viruses into a phylum Vira Zhdanov and Korenblut 1949, ignoring the earlier use of this name by Holmes (1939) for substantially the same group. Three classes are recognized, the Protophytoviralis, Phytoviralia, and the Zooviralia for the bacterial viruses, the plant viruses, and the animal viruses respectively. Zhdanov does not further discuss the bacterial or plant viruses, elaborating only the classification of the Zooviralia. The essential feature is that the rickettsias, the bartonellas and the chlamydozoa are grouped with the filterable viruses. Names of these taxa as given in the 6th (1948) edition of the Bergey Manual are regularly cited, frequently, however, as synonyms of new names (given by Russians) quite certainly not having priority. In some cases the author of a name is incorrectly given, i.e. the ordinal name Rickettsiales is ascribed to Bengston.

The proposed classification and names of Zhdanov should be made available to non-Russian readers. They are outlined and listed below. No attempt has been made to indicate the

numerous errors in nomenclature. The synonymy given by Zhdanov will enable the reader to interpret reasonably well the characteristics of the several groups (taxa).

The book has a brief editorial foreword and preface which may be paraphrased as follows:

"From the Editor's Office" (page 2)

The demand for the development of a classification and for a system of naming viruses is very real. The abundant data that have been gathered need to be surveyed and systematized.

The author takes the responsibility for having prepared the classification of viruses from the standpoint of Russia.

The overall problems of classification and of development of viruses are reviewed in the first part of the book. The author has found it necessary to make some hypothetical assumptions, for knowledge of the natural evolution and properties of viruses is still inadequate.

The evolution of viruses is developed here for the first time in detail in the literature. In the second part of the text full descriptions are given of the viruses known. This review presents not only our own (Russian) literature but also that of the entire world.

The discussions which will arise as a result of the publication of this book should bring new improvements and should lead to a development of a general Soviet approved classification based on the present biologic concepts of Michurin.

Author's Preface (page 3)

The science of viruses, which had its beginning in Russia, has grown during recent decades into an independent scientific discipline. One part of virology that has developed is a classification and nomenclature. The need for preparing a Soviet classification and nomenclature of viruses arises from the progress made in the development of general virology and from practical necessity. This need is still greater because a classification has been published abroad (e.g. the classification by Holmes in the 6th edition of Bergey's Manual of Determinative Bacteriology). This is drawn upon a

foolish basis, and there is danger that it will be accepted without critical analysis.

A tentative classification and nomenclature of viruses is given from the viewpoint of our own country (Russia) in the present book. The place of viruses among living organisms and their evolution is discussed in the first part together with a review of the literature covering the classification and nomenclature of viruses as written by various authors. In the second part descriptions of the species of viruses are given as taken from the literature.

The author fully realizes that his arrangement is imperfect and tentative. He will appreciate courteous criticisms.

The classification of the phylum Vira as detailed by Zhdanov is outlined below. The page number of the treatise on which names and synonymy are given ends each citation. As noted above, there are no corrections even of obvious errors.

VIRA. V.H. Zhdanov and R.S. Korenblut (p. 147)

Class I. Protophytoviralia class. nov. (p. 147)
Class II. Phytoviralia class. nov. (p. 147)
Class III. Zooviralia class. nov. (p. 148)

Order I. Rickettsiales Bengston 1948 (p. 149)

Family I. Rickettsiaceae Pinkerton 1936 (p. 149)

Genus I. Rickettsia da Rocha-Lima 1916 (p. 150)

Subgenus I. Rickettsia Z. and K. 1949 (p. 151)

1. Rickettsia prowazeki da Rocha-Lima 1916 (da Rocha-Lima 1916). (Rickettsia exanthematotyphi Kodama 1932: Rickettsia prowazeki var. prowazeki Pinkerton 1936; Rickettsia prowazeki subspecies prowazeki Philip 1943). (p. 151).

2. Rickettsia mooseri Monteiro 1931 (Wolbach et Todd, 1920) (Dermacentroxenus typhi Wolbach et Todd 1920; Rickettsia manchuriae Kodama et al. 1932; Rickettsia murina Megaw 1953; Rickettsia fletcheri Megaw 1935; Rickettsia prowazeki var. mooseri Pinkerton 1936; Rickettsia prowazeki subspecies typhi Philip 1943; Rickettsia typhi 1943) (p. 153).

Subgenus 2. Ixodoxenus nom. nov. (Dermacentroxenus Z. and K. 1949) (p. 155).

1. Ixodoxenus rickettsi comb. nov. (Ricketts 1909) (Dermacentroxenus rickettsi Wolbach 1919; Rickettsia rickettsi Brumpt 1922; Rickettsia brasiliensis Monteiro 1931; Rickettsia typhi Amaral et Monteiro 1933; Dermacentroxenus rickettsi var. brasiliensis Pinkerton 1936). (p. 155).

2. Ixodoxenus conori comb. nov. (Brumpt 1932) (Rickettsia conorii Brumpt 1932; Rickettsia megawi var. pijperi Amaral et Monteiro 1932; Rickettsia blanci Caminopetros 1932; Dermacontroxenus rickettsi var. pijperi Mason et Alexander 1939; Dermacentroxenus rickettsi var. conori Mason et Alexander 1939; Dermacentroxenus conorii Steinhaus 1946). (p. 157).

3. Ixodoxenus sibiricus comb. nov. (Krontovskaia) Dermacentroxenus rickettsi var. sibirica; Dermacentroxenus sibiricus Zdrodovskii 1949). Causes an eruptive (exanthematic) typhoid fever in Siberia. (p. 158).

4. Ixodoxenus austrailis nom. nov. (Andrew et al. 1946) (Dermacentroxenus austrailis Z. and K. 1949) (p. 159).

Subgenus 3. Gamasoxenus nom. nov. (Acaroxenus Z. and K. 1949) (p. 159).

1. Gamasoxenus muris nom. nov. (Huebener et al. 1946). (Rickettsia akari Heubner et al. 1946;

Acaroxenus varioloidis Z. and K. 1949) (p. 159).

Genus 2. Trombidoxenus Z. and K. 1949.

1. Trombidoxenus orientalis Z. and K. 1949 (Hayashi 1920) (Theileria tsutsegamushi Hayashi 1920; Rickettsia orientalis Nagayo et al. 1930; Rickettsia tsutsugamushi Ogata 1931; Rickettsia akamushi Kawamura et Imagawa 1931; Rickettsia orientalis var. schuffneri Amaral et Monteiro 1932; Rickettsia megawi Amaral et Monteiro 1931; Rickettsia megawi var. fletcheri Amaral et Monteiro 1931; Rickettsia tsutsugamushi-orientalis Kawamura et al. 1934; Rickettsia pseudo-typhi ver Woort 1938; Rickettsia sumatranus Kouwenaar et Wolff 1942; Dermacentroxenus orientalis Moshkavshi 1945). (p. 160).

2. Trombidoxenus americanus spec. nov. (Baker, 1946). Causes a disease of rodents in Canada. (p. 162).

Genus 3. Coxiella Philip 1943. (p. 163).

1. Coxiella diaporica comb. nov. (Derrick, 1937). (Rickettsia burneti Derrick 1939; Rickettsia diaporica Cox 1939; Rickettsia diaporica var. americana Anonym. 1941; Rickettsia (Coxiella) burneti Philip 1943; Rickettsia burneti var. caprina Caminopetros 1949). (p. 163)

Genus 4. Wolhynia Z. and K. 1949. (p. 164).

1. Wolhynia quintanae Z. and K. 1949. (Topfer 1916) Rickettsia quintana Schminke 1917; Rickettsia wolhynica Jungment et Kuczvnski 1918; Rickettsia weigli Mosing 1934; Fossilis quintana Megaw 1943) (p. 165)

2. Wolhynia rutchkovskyi Z. and K. 1949. (Rickettsia quintana Rutchkovsky 1945) (p. 165)

Genus 5. Kurlovia nom. nov.

Subgenus 1. Cowdria Moshkovski 1945. (p. 166)

1. Cowdria ruminantium Moshkovski 1945 (Cowdry, 1925). (Rickettsia ruminantium Cowdry 1925; Rickettsia (Cowdria) ruminantium Moshkovski 1945). (p. 166).

2. Cowdria suis comb. nov. (Donation et Gayot, 1942). (Rickettsia suis Donation et Gayot 1942). (p. 167)

Subgenus 2. Ehrlichia subgen. nov. (p. 167)

1. Ehrlichia kurlovi subgen. nov. Moshkovski 1937 (Kurlov 1889). (Erlichia (sic) (Rickettsia) kurlovi Moshkovski 1937). (p. 168).

2. Ehrlichia canis Moshkovski 1937; (Donation et Lestoquard 1937). (Rickettsia canis Donation et Lestoquard 1937; Ehrlichia (Rickettsia) canis Moshkovski 1937). (p. 168)

3. Ehrlichia bovis Moshkovski, 1947. (Donation et Lestoquard 1936). (Rickettsia bovis Donation et Lestoquard 1936). (p. 169)

4. Ehrlichia ovina Moshkovski 1945. (Lestoquard et Donation 1936). (Rickettsia ovina Lestoquard 1936). (p. 169)

Family II. Chlamydozoaceae Moshkovski 1945.

Genus 1. Rickettsiaformis Z. and K. 1949. (p. 175)

Subgenus 1. Rickettsiaformis subg. nov. (p.175)

1. Rickettsiaformis psittacosis Z. and K. 1949. (Levinthal, 1930) (Microbacterium multiforme psittaci Levinthal 1930; Rickettsia psittaci Lillie 1930; Ehrlichia (Miyagawanella) psittaci Moshkovski 1945; Miyagawanella psittacii Rake 1948; Chlamydozoon psittaci Ryshkov 1950). (p. 176)

2. Rickettsiaformis ornithosis Z. and K. 1949 (Meyer, 1941). Miyagawanella ornithosis Rake 1948; Chlamydozoon columbi Rhzhkov 1950). Virus isolated from parrots. (p. 177)

3. Rickettsiaformis pullorum spec. nov. (Nelson, 1936). Causes an infectious cold in chickens and in other birds. (p. 178)

4. Rickettsiaformis columbarum spec. nov. (Hart, 1940). Causes an infectious sinusitis in pigeons. (p. 179)

5. Rickettsiaformis pneumoniae Z. and K. 1949 (Eaton et al., 1941). (Miyagawanella pneumoniae Rake 1948; Chlamydozoon hominis Ryzhkov 1950; (Eaton et al., 1941) (p. 180)

6. Rickettsiaformis pneumomeningitidis spec. nov. (Levi, 1949). Isolated from spinal fluid of a patient sick with meningitis. It is possible that the same virus is the cause of pseudolymphocytic choriomeningitis (Mac Callum et al., 1939; Legio simulans Holmes 1948). Its relationship to R. meningopneumoniae is not clear. (p. 181)

7. Rickettsiaformis muris Z. and K. 1949 (Dochez et al., 1936). (Ehrlichia (Miyagawanella) bronchopneumoniae Moshkovski 1945; Miyagawanella bronchopneumoniae Rake 1938; Chlamydozoon murinus Ryzhkov 1950). (p. 182)

8. Rickettsiaformis meningopneumoniae Z. and K. 1949 (Francis et Magill, 1938). (Chlamydozoon meningophilus Ryzhkov 1950) This appears to be the same virus or a variation of the virus which was isolated from mice. (Eaton et al., 1942) Causes meningopneumonia. (p. 183)

9. Rickettsiaformis rodentium spec. nov. (Nelson, 1937). The cause of infectious catarrh in white mice. (p. 184).

10. Rickettsiaformis rattum spec. nov. (Nelson, 1940). The cause of infectious catarrh in white rats. Its relationship to a pneumonia of wild rats (Nelson, 1949) and a pneumonia of gray rats (Andrewes and Glover, 1949) is not clear. (p. 185).

11. Rickettsiaformis opposum nom. nov. (Roca-Garcia, 1949). (Opposum virus (Roca-Garcia 1949). Chlamydozoon opposumi Ryzhkov 1950). The cause of a sickness in the opposum Family Didelphidae. (p. 185)

12. Rickettsiaformis caviae spec. nov. (Pellisier et al., 1950). Latent virus of guinea pigs. (p. 186)

13. Rickettsiaformis felis Z. and K. 1949 (Baker, 1942). (Miyagawanella felis Rake 1948; Chlamydozoon felis Ryzhkov 1950). (p. 187)

14. Rickettsiaformis bovis nom. nov. (York et Baker, 1951). (Miyagawanella bovis York et Baker 1951). Cause of a systematic infection in calves. (p. 187)

15. Rickettsiaformis ovis spec. nov. (Monsur et Barwell 1951). Cause of an infectious abortion in sheep. (p. 188)

16. Rickettsiaformis lymphogranulomatis Z. and K. 1949. (Hellestrom et Wasseu, 1930). (Miyagawanella lymphogranulomatis Brumpt 1938; Ehrlichia lymphogranulomatis mauro; Ehrlichia (Miyagawanella) lymphogranulomatis Moshkovski 1945; Chlamydozoon lymphophilus Ryzhkov 1950). (p. 188)

Genus 2. Chlamydozoon Halbestädter et Prowazek 1907.

1. Chlamydozoon trachomatis Foley et Parrot 1937. (Halbestadter et Prowazek, 1907). (Rickettsia trachomae Busacca 1939; Rickettsia trachomatis Foley et Parrot 1937). (p. 190)

2. Chlamydozoon oculogenitale Moshkovski 1945. (Halbestadter et Prowazek, 1909). (p. 191)

3. Chlamydozoon pecoris Z. and K. 1949 (Coles, 1931) (Rickettsia conjunctivae Coles 1931; Chlamydozoon conjunctivae 1945; Colesiota conjunctivae Rake 1948). (p. 191)

4. Chlamydozoon pullorum Z. and K. 1949 (Coles, 1940). (Rickettsia conjunctivae-galli Coles 1940; Colesiota conjunctivae-galli Rake 1948). (p. 192)

Order II. Strongyloplasmales nom. nov. (p. 194)

Family I. Strongyloplasmaceae Z. and K. 1942 (p.195).

Genus I. Strongyloplasma Lipschütz 1912 (p. 195).

Subgenus I. Strongyloplasma Z. and K. 1949.

1. Strongyloplasma variolae Lipschutz 1912 (Guarnieri, 1892); Borreliota variolae Goodpasture 1933; Paschenia hominis Ryzhkov 1950).

2. Strongyloplasma vaccinae Moshkowski 1945 (Guarnieri, 1892) (Paschenia bovis Ryzhkov 1950). (p. 198)

3. Strongyloplasma ectromeliae nom. nov. (Marshall, 1930). (Cytoryctes ectromeliae Moshkowski 1945; Scelus marmorans Holmes 1948; Latens ectromeliae Z. and K. 1949; Paschenia murina Ryzhkov 1950). (p. 200)

Subgenus 2. Borreliota Z. and K. 1949. (p.201)

1. Borreliota avium Goodpasture 1933 (Borrel, 1903). (Strongyloplasma avium Lipschütz 1930). (p. 201)

Subgenus 3. Zoovariola Z. and K. 1949. (p.203)

1. Zoovariola suis nom. nov. (Poenaru, 1913).

(Borreliota suis Holmes 1948). (p. 203)

2. Zoovariola ovis Z. and K. 1949. (Latentis ovis Ryzhkov 1950). Cause of pox in sheep. Differs from S. vacciniae var. ovis. (p. 204)

Subgenus 4. Varicella Z. and K. 1949 (p. 204)

1. Varicella varicellae Z. and K. 1949 (Aragao, 1911). (Strongyloplasma varicellae Moshkowski 1945; Cytoryctes varicellae Ryzhkov 1950; Briareus varicellae Holmes 1848). (p. 204)

2. Varicella zonae Z. and K. 1949 (Paschen, 1933) (Cytoryctes varicellae subsp. zoster Ryzhkov 1950) (p. 205)

Genus 2. Latens Z. and K. 1949. (p. 206)

Subgenus 1. Latens Z. and K. 1949. (p. 206)

1. Latens herpetis Z. and K. 1949 (Grüther, 1912) (Neurocystis herpetii Levanditi et Schoen 1927; Scelus recurrens Holmes 1948; Latentia herpes Ryzhkov 1950). (p. 206)

2. Latens pemphigi spec. nov. (Urbach et Reiss, 1930). (p. 208)

3. Latens dermatitidis spec. nov. (Poincleau, 1924) (p. 208)

4. Latens pseudorabiei nom. nov. (Aujescky, 1902) (Scelus suillum Holmes 1948; Neuroryctes pseudorabeie Z. and K. 1949; Latentia aukescky Ryzhkov 1950). (p. 208)

5. Latens paravacciniae Z. and K. 1949 (Morozov, 1930). (Strongyloplasma paravacciniae Morozov 1940). Cause of an infectious dermatitis in sheep. (p. 209)

6. Latens cuniculi Z. and K. (Sabin and Wright,

1934). (Scelus beta Holmes 1948; Latentia beta Ryzhkov 1950). (p. 210)

Subgenus 2. Ulcerogenes Z. and K. 1949 (p. 211)

1. Ulcerogenes ovium A. and K. 1949 (Aynaud, 1921; Tunnicliff et Matisheck, 1941). (Scelus ulceris Holmes 1948; Latentia ovis Ryzhkov 1950). (p. 211)

2. Ulcerogenes vitulorum Z. and K. 1949 (Mason et Neitz, 1940). (Scelus bovinum Holmes 1948). (p. 212)

3. Ulcerogenes equorum. Z. and K. 1949 (Olitzky, 1927). (Hostis equinus Holmes 1948; Latentia equi Ryzhkov 1950). (p. 212)

Family II. Neuroryctaceae Moshkovski 1945. (p. 217)

Genus I. Neuroryctes Moshkowski 1945 (p. 218).

1 and 2. Neuroryctes rabiei Z. and K. 1949 (Pasteur, 1880). (Neuroryctes hydrophobiae Calkins 1907; Encephalitozoon rabiei Manouelian et Viala 1924; Glugea lyssae Lovaditi et al. 1928; Formido inexorabilis Holmes 1948; Latentia pasteuriana Ryzhkov 1950). (p. 218)

1. Neuroryctes rabiei communis. (p. 220)
2. Neuroryctes rabiei fixatus. (p. 220)

3. Neuroryctes bovis spec. nov. (Patto, 1932) Cause pseudorabic disease in cattle. (p. 220)

4. Neuroryctes aegypticum spec. nov. (Carpano, 1929). Cause of rabies in dogs. (p. 221)

Genus 2. Demyelinisator Z. and K. 1949. (p. 221)

1. Demyelinisator hominis Z. and K. 1949. (Solov'ev and Shubladzo, 1942) (Myelinophagus hominis Ryzhkov 1950). Cause of a sharp encephalomyelitis and sclerosis in man. (p. 221)

2. Demyelinisator vulpis Z. and K. 1949 (Green, 1926). (Tapreia vulpis Holmes 1948; Myelinophagus vulpis Ryzhkov 1950. (p. 222)

3. Demyelinisator zibellinae nom. nov. (Solov'ev and Shubladze 1942) (Myelinophagus solovievi Ryzhkov 1950). (p. 223)

4. Demyelinisator sibiricus spec. nov. (Levenberg 1936). (p. 223)

5. Demyelinisator muris spec. nov. (Cheever et al. 1949). Cause of an encephalomelytis in white mice. (p. 224)

Genus 3. Vyscholesskyella Z. and K. 1949.

1. Vyscholesskyella equina Z. and K. 1949 (Zwick et Seifried 1924). Erro bornensis Holmes 1948; Latentia borna Ryzhkov 1950. (p. 224)

Family III. Tumefaciaceae nom. nov. (p. 226)

Genus 1. Tumefaciens Z. and K. 1949. (p. 227)

1. Tumefaciens verrucarum Z. and K. 1949 (Cuiffo, 1907). Molitor verrucae Holmes 1948; Papillomiferus hominis Ryzhkov 1950; Papilomiferus laryngophilus Ryzhkov 1950). (p. 227)

2. Tumefaciens mollusci Z. and K. 1949 (Lipschütz 1911). (Strongyloplasma hominis Lipschütz 1911; Molitor hominis Holmes 1948). (p. 228)

3. Tumefaciens bovis Z. and K. 1949 (Creech, 1929) (Molitor bovis Holmes 1942; Papillomiferus bovis Ryzhkov 1950). (p. 228)

4. Tumefaciens canis Z. and K. 1949 (DeMonbreun et Goodpasture, 1932). (Molitor buccalis Holmes 1948; Papilomiferus canis Ryzhkov 1950) (p. 229)

5. Tumefaciens fibromyxomatis Z. and K. 1949

(Aragão, 1911). (Chamydozoon myxomae Aragão 1911; Strongyloplasma myxomae Aragão 1927; Sanareilla cuniculi Lipschütz 1927; Molitor myxomae Holmes 1948; Tumoriferus myxomae Ryzhkov 1950). (p. 229)

6. Tumefaciens gingivalis Z. and K. 1949. (Parsons et Kidd, 1943). (Molitor gingivalis Holmes 1948). (p. 230)

7. Tumefaciens papillomatis Z. and K. 1949 (Shope 1933). (Molitor sylvilagi Holmes 1948; Papillomiferus leporis Ryzhkov 1950). (p. 231)

8. Tumefaciens lactogenes nom. nov. (Bittner, 1936) (Briareus adeno-carcinomatis murium Morozov 1949; Tumefaciens muris Z. and K. 1949; Tumoriferus lactis Ryzhkov 1950). Cause of a cancer in the mammary gland of mice. (p. 231)

9. Tumefaciens muris Z. and K. (Zilber, 1945) (p. 233).

10. Tumefaciens sarcomatis Z. and K. 1949 (Rous, 1911). (Molitor tumoris Holmes 1948; Tumoriferus avium Rhyzhkov 1950). (p. 234)

11. Tumefaciens gallinarum nom. nov. (Ellermann et Bank, 1908). (Trifur gallinarum Holmes 1948; Sanguiphilus gallinarum Z. and K. 1949; Tumoriferus avium subsp. leucosoferus Ryzhkov 1950). Cause of an infectious leukemia in chickens. (p. 235)

12. Tumefaciens ranae Z. and K. 1949 (Lucke, 1934). Cause of tumors in the leopard frog. (p. 236).

13. Tumefaciens batrachorum spec. nov. (Sanfelice, 1913). Cause of a small tumor of the skin in frogs. (p. 236)

14. Tumefaciens prinus Z. and K. 1949 (Keysselitz,

1868). Cause of a smallpox (epithelioma) in carp (Fam. Cyprinidae). (p. 236)

Order III. Gamaleiales ord. nov. (p. 241)

Family I. Pneumophilaceae Z. and K. 1949. (p. 241)

Genus I. Pneumophilus Z. and K. 1949. (p. 242)

1-5. Pneumophilus gripposus Z. and K. 1949 (Smith et al., 1933). (Tapreia alpha Holmes 1948; Tapreia beta Holmes 1948; Pneumotropus grippae Ryzhkov 1950). (p. 243)

1. Pneumophilus gripposus A.
2. Pneumophilus gripposus A_1.
3. Pneumophilus gripposus B.
4. Pneumophilus gripposus C.
5. Pneumophilus suis.

6. Pneumophilus parotitidis nom. nov. (Johnson et Goodpasture, 1934). Rabula inflans Holmes 1948; Glandulophilus parotitidis Z. and K. 1949; Glandulophilus hominis Ryzhkov 1950). Cause of an epidemic parotitis. (p. 245).

7. Pneumophilus pullorum nom. nov. (Doyle, 1927). (Tortor flurens Holmes 1948; Pestigenes newcastlei Z. and K. 1949; Flagellophorus pseudopestis Ryzhkov 1949). Cause of a fatal disease of fowls.(p.246)

8. Pneumophilus paragripposus spec. nov. (Hirst, 1949). Cause of an acute form of catarrh (influenza) (p. 247)

9. Pneumophilus pneumoniae Z. and K. 1949 (Dochez et al., 1937). (Tarpeia promens Holmes 1948; Pneumotropus incognitus Ryzhkov 1950). (p. 247)

10. Pneumophilus muris spec. nov. (Andrewes, 1945). Cause of a pneumonia (Broncho-pneumonia, infectious catarrh) in mice. It appears to be the same species of virus that was isolated in 1946 (Horsfall and Curnen). (p. 249)

11. Pneumophilus rattum spec. nov. (Nelson, 1948) Cause of a pneumonia in white rats. (p. 249)

12. Pneumophilus equi nom. nov. (Koliskov and Rozhnov, 1943). (Pneumopropus equi Ryzhkov 1950) (p. 249)

Genus 2. Enterophilus Ryzhkov, 1950. (p. 250)

1. Enterophilus vitulorum nom. nov. (Baker, 1942) (Tarpeia vitulae Holmes 1948; Pneumophilus vitulorum Z. and K. 1949; Pneumotropus bovis Ryzhkov 1950). Cause of an infectious bronchitis in horned cattle. (p. 250)

2. Enterophilus felis Ryzhkov 1950. (Verge et Cristopheroni, 1928). (Tarpeia felis Holmes 1948; Pestigenes felis Z. and K. 1949). Cause of a laryngic enteritis in cats. It appears that this virus is identical with the virus of cats described by Hindle et Findlay, 1932. (p. 250)

3. Enterophilus pullorum nom. nov. (Beach et Seifried, 1931). (Tarpeia avium Holmes 1948; Ulcerogenes pullorum Z. and K. 1949; Pneumotropus avium Ryzhkov 1950). Cause of a laryngic tracheitis in birds. (p. 252).

4. Enterophilus murinus spec. nov. (Cheever et al. 1946). Cause of a diarrhoea in suckling mice. (p. 252)

Family II. Gamaleiaceae fam. nov. (p. 253)

Genus I. Gamaleia nom. nov. (p. 253)

1. Gamaleia bovis nom. nov. (Gamaleia, 1886). (Tortor bovis Holmes 1948; Pestigenes bovis Z. and K. 1949). Cause of a plague in horned cattle. (p. 253)

2. Gamaleia suis nom. nov. (Dorkamp, 1929). Tortor suis Holmes 1948; Pestigenes suis Z. and K.

1949; Enterophilus porci Ryzhkov 1950). Cause of a bilious disease (cholera) in pigs. (p. 254)

3. Gamaleia viverrae spec. nov. (Glanetz et Smetana, 1937). (Tarpeia viverrae Holmes 1948; Pestigenes viverrae Z. and K. 1949). Cause of a ferret distemper. (p. 255)

4. Gamaleia caviae spec. nov. (Gasperi et Sangiorgi 1916). Cause of a distemper in guinea pigs. This is apparently identical with the virus described by Petri and O'Brien, 1910. (p. 255).

5. Gamaleia pullorum nom. nov. (Centanni, 1901). (Tortor galli Holmes 1948; Pestigenes pullorum Z. and K. 1949; Pantropus avium Ryzhkov 1950. Cause of an infectious disease in birds. (p. 255)

6. Gamaleia aegypticum nom. nov. (Lagrange, 1929). (Pestigenes aegypticum Z. and K. 1949). Cause of a pneumonia in birds in Egypt. (p. 256)

Genus 2. Polynosa gen. nov. (p. 257)

1. Polynosa morbillorum nom. nov. (Anderson et Goldberg, 1911). (Briareus morbillorum Holmes 1948; Maculigenes morbillorum Z. and K. 1949; Rubeoleferus morbillorum Ryzhkov 1950). Cause of measles (Rubeola) in man and monkeys.(p.257)

2. Polynosa canis nom. nov. (Carro, 1904). (Tarpeia canis Holmes 1948; Pestigenes canis Z. and K. 1949; Enterophilus canis Ryzhkov 1950; Cause of a disease in dogs. (canine distemper) (p. 258)

3. Polynosa latens spec. nov. Cause of a polio-like disease in man. (p. 259)

Family III. Botkiniaceae Ryzhkov 1950. (p. 264)

Genus I. Botkinia Ryzhkov 1950. (p. 264)

1. Botkinia hominis nom. nov. (Hepatophilus hominis Z. and K. 1949; Botkina hepatica Ryzhkov 1950). Cause of an epidemic hepatitis in man. (p. 265)

2. Botkinis suilla nom. nov. (Anderson, 1937). (Hepatophilus suillus Z. and K. 1949). Cause of a hepatitis in pigs. (p. 266)

3. Botkinis muris nom. nov. (Chodukin et al. 1949). (Hepatophilus muris Z. and K. 1949). Cause of a hepatitis in mice. (p. 266)

4. Botkinia equi nom. nov. (Dimock et Edwards, 1936). Tortor equae Holmes 1948). Cause of an abortion in mares (p. 267)

5. Botkinia canis spec. nov. (Rubarth, 1947). Cause of a hepatitis in dogs. (p. 267)

Genus 2. Glandulophilus Z. and K. 1949. (p.267)

1. Glandulophilus caviae nom. nov. (Jackson, 1920) (Rabula levis Holmes 1948; Glandulophilus rodentium Ryzhkov 1950). This is a virus from the salivary glands of guinea pigs. (p. 267)

2. Glandulophilus rattum nom. nov. (Thompson, 1932). Rabula exigus Holmes 1948). This is a virus from the salivary glands of rats. (p. 268)

3. Glandulophilus murium nom. nov. (Kuttner et Wang, 1934). (Rabula latens Holmes 1948). This is a virus from the salivary glands of mice. (p.268)

4. Glandulophilus cricetuli nom. nov. (Kuttner et Wang, 1934). (Rabula innocuus Holmes 1948). This is a virus of the salivary glands of the Chinese hamster (Genus - Cricetus). (p. 269)

5. Glandulophilus simii spec. nov. (Cowdry et Scott, 1935). Virus of the salivary glands of monkeys. (p. 269)

6. Glandulophilus hominis spec. nov. (Zhdanov et al., 1949). Causes an inflammation of human salivary glands. (p. 269)

Order IV. Arthropodophiliales ord. nov. (p. 273)

Family I. Acarophilaceae fam. nov. (p. 274)

Genus 1. Encephalophilus Z. and K. 1949. (p. 274)

1. Encephalophilus silvestris nom. nov. (Zilber, 1937). (Erro silvestris Holmes 1948; Encephalotropus silveri Ryzhkov 1950). Cause of a tick-borne, spring-summer encephalitis. (p. 275)

2. Encephalophilus occidentalis spec. nov. (Zilber, 1945). Cause of a tick-borne encephalitis in West Europe. (p. 276)

3. Encephalophilus scotticus Z. and K. 1949 (Mackie, 1931). (Erro scotticus Holmes 1948; Encephalotropus ovis Ryzhkov 1950). (p. 276)

4. Encephalophilus australis nom. nov. (Cleland et Campbell, 1919). (Erro incognitus Holmes 1949; Encephalotropus australiensis Ryzhkov 1950). Cause of an Australian encephalitis (X-disease). (p. 277)

5. Encephalophilus murinus spec. nov. (Zhdanov et Levi, 1949). Cause of a spontaneous encephalomyelitis in mice. (p. 277)

6. Encephalophilus intermedius spec. nov. (Levi, 1950). Cause of a spontaneous encephalomyelitis in mice. (p. 278)

Genus 2. Meningophilus Ryzhkov 1950. (p. 279)

1. Meningophilus choriomeningitidis nom. nov. (Armstrong et Lillie, 1934). (Legio erebea Holmes 1948; Neurophilus chorimeningitidis Z. and K. 1949; Meningophilus muris Ryzhkov 1950). Cause of a

lymphocytic choriomeningitis. This virus was isolated and described by Bingle, 1951. (p. 279)

Genus 3. Haemorrhagogenes Z. and K. 1949. (p. 281)

1. Haemorrhagogenes tchumakovi nom. nov. (Tchumakov et al, 1944). (Pantrophus tchumakovi Ryzhkov 1950). Cause of a hemorrhoidal fever in southern U.S.S.R. (p. 282)

2. Haemorrhagogenes sibiricus Z. and K. 1949 (Tchumakov et al., 1947). (Pantropus tchumakovi subspec. dermacentori Tyzhkov 1950). Causes tick-borne fever in Siberia. (p. 282)

3. Haemorrhagogenes orientalis Z. and K. 1949. (Smorodincev et al., 1949). Causes a tick-borne fever in Manchuria (p. 283).

4. Haemorrhagogenes nephritidis Z. and K. 1949 (Smorodincev et al., 1949). Causes an infectious nephritis. (p. 283)

5. Haemorrhagogenes suis nom. nov. (Durand et al., 1936). (Legio suariorum Holmes 1948). Causes a disease in young pigs in Switzerland. (p. 284)

Family II. Insectophilaceae fam. nov. (p. 285)

Genus 1. Insectophilus gen. nov. (p. 285)

Subgenus 1. Neurophilus sub. gen. nov. (p. 286)

1. Neurophilus japonicus nom. nov. (Hayeshi, 1933) (Erro japonicus Holmes 1948; Encephalophilus japonicus Z. and K. 1949; Encephalotropus japonicus Ryzhkov 1950). Cause of an encephalitis in horses in Japan. (p. 286)

2. Neurophilus americanus nom. nov. (Muckenfuss et al., 1933). (Erro scelestus Holmes 1948; Ence-

phalophilus americanus Z. and K. 1949; Encephalotropus St. Lui Ryzkov 1950). Cause of an American encephalitis (St. Louis). (p. 267)

3. Neurophilus nili nom. nov. (Smithburn et al., 1940). (Erro nili Holmes 1948; Encephalophilus nili Z. and K. 1949; Encephalotropus nilensis Ryzhkov 1950). Cause of an encephalitis in West Nile Region. (p. 288)

4. Neurophilus ilheus spec. nov. Virus isolated from mosquito, Aedes psorophora et Ilheus. Brazil. Causes inflammation of brain in white mice. (p. 289)

5. Neurophilus conjunctivitidis spec. nov. (Sanders 1942). (Chlamydozoon kerato-conjunctivae Ryzhkov 1950). Cause of a kerato-conjunctivitis in man and some species of animals. (p. 289)

Subgenus 2. Viscerophilus subgen. nov.

1. Viscerophilus tropicus Z. and K. 1949 (Reed et Carrol 1901). (Charon evagatus Holmes 1948; Pantropus flavus Ryzhkov 1950).

2. Viscerophilus dengue Z. and K. 1949 (Ashburn et Craig, 1907). (Pantropus dengue Ryzhkov 1950). Cause of dengue fever (in warm climates). Vector is a mosquito, Aedes aegypti. (p. 292)

3. Viscerophilus bwamba Z. and K. 1949 (Smithburn et al., 1941). Cause of a fever (bwamba) in mice and monkeys. (p. 293)

Genus 2. Febrigenes gen. nov. (p. 293)

1. Febrigenes pappatasii nom. nov. (Doerr et al., 1908). (Viscerophilus pappatasii Z. and K. 1949; Pantropus pappatasii Ryzhkov 1950). Cause of a disease known as pappatasia fever in tropical and subtropical regions. Vectors are insects, Phlebotomus pappatasii and Phlebotomus caucasicus. (p. 293)

2. Febrigenes africanus nom. nov. (Daubney et al., 1931) (Charon vallis Holmes 1948; Viscerophilus africanus Z. and K. 1949; Pantropus ovies Ryzhkov 1950.) Cause of an infectious hepatitis. (p. 294)

3. Febrigenes semliki nom. nov. (Smithburn et Haddow, 1944). (Viscerophilus semliki Z. and K. 1949). Cause of an intestinal disease in wild monkeys (Cercopithecus nictitans), sometimes in man. Vector is a mosquito, Aedes abnormalis. (p. 295)

4. Febrigenes bunyamwera spec. nov. (Smithburn et al., 1946). Virus was observed in Bumyamwera (place in region of Ugande). Details are not known. It can be assumed that the infected animals may be wild monkeys. Vectors are mosquitos from which virus was isolated. (p. 295)

5. Febrigenes anophelinus spec. nov. (Roca-Garcia, 1944). Isolated from mosquitos (Anopheles boliviensis). Physical properties like F. bunyamwera, immunologically different. (p. 296)

6. Febrigenes brasiliensis spec. nov. (Roca-Garcia, 1944). (Anopheles B. virus Roca-Garcia, 1944). Isolated from mosquitos Anopheles boliviensis. Typical properties like F. anophelinus, immunologically different. (p. 296)

7. Febrigenes heterogenes spec. nov. (Hughes et Porlowagora, 1950). Virus isolated from mosquitos sick from yellow fever. Immunologically different from above-mentioned viruses. (p. 296)

8. Febrigenes equi nom. nov. (Alexander et Toit, 1934). (Tortor equorum Holmes 1948; Pantropus equi Ryzhkov 1950). Cause of an African plague of horses. (p. 296)

9. Febrigenes ovis nom. nov. (Becker et al., 1934) (Tortor ovis Holmes 1948). Cause of fever in sheep (blue tongue). (p. 297)

Family III. Polyvectaceae fam. nov. (p. 299)

Genus 1. Polyvectus gen. nov. (p. 299)

1. Polyvectus occidentalis nom. nov. (Meyer et al., 1931). (Erro equinus Holmes 1948; Encephalopilus equinus Z. and K. 1949; Neurotropus americanus Ryzhkov 1950). Cause of an encephalomyelitis in horses in Western North America. (p. 299)

2. Polyvectus orientalis spec. nov. (Ten Broek et Merrill, 1933). Cause of an encephalomyelitis in horses in Eastern North America. (p. 301)

3. Polyvectus venezuelensis spec. nov. (Casals et al., 1943). Cause of an encephalomyelitis in Venezuela. (p. 302)

4. Polyvectus colorado nom. nov. (Becker, 1930). (Viscerophilus colorado Z. and K. 1949). Cause of a tick fever in Colorado. (p. 302)

5. Protovirales ord. nov. (p. 303).

1. Neuromyophilaceae fam. nov. (p. 303)

1. Myelophilus gen. nov. (p. 304)

1. Myelophilus hominis nom. nov. (Landsteiner, 1908). (Legio debilitans Holmes 1948; Neurophilus poliomyelitidis Z. and K. 1949; Virothrix hominis Ryzhkov 1950). Cause of poliomyelitis in man. (p. 304)

2. Cerebrophilus gen. nov. (p. 307)

1. Cerebrophilus muris nom. nov. (Theiler, 1935). (Legio muris Holmes 1948; Neurophilus muris Z. and K. 1949; Virothrix theileri Ryzhkov 1950). Causes poliomyelitis in mice. (p. 307)

2. Cerebrophilus caviae (Römer, 1901). (Neurophilus caviae Z. and K. 1949). Cause of a para-

lysis (pseudopoliomyelitis) in guinea pigs. (p. 308)

3. Cerebrophilus suis spec. nov. (Gard, 1943) (p. 308)

4. Cerebrophilus gallinarum nom. nov. (Jones, 1932) (Legio gallinae Holmes 1948; Neurophilus gallinarum Z. and K. 1949; Myelinophagus avium Ryzhkov 1950) (p. 308)

Genus 3. Cardiophilus gen. nov.

1. Cardiophilus mengo nom. nov. (Dick et al., 1948) (Neurophilus mengo Z. and K. 1948; Virothrix cardiophilus subsp. mengo Ryzhkov 1950). Cause of encephalitis mengo (Mengo – name of place in the Ugande region). Isolated from sick people and animals. Source of virus – monkeys. Vectors, mosquitos. (p. 309)

2. Cardiophilus urbanus spec. nov. (Jungeblutt et Sanders, 1940). (p. 310)

Genus 4. Myophilus gen. nov. (p. 310)

1. Myophilus hominis spec. nov. (Dalldorf et Sickles, 1948). Coxsackie virus. (p. 310)

Family II. Sanguiphilaceae fam. nov. (p. 312)

Genus 1. Sanguiphilus Z. and K. 1949. (p. 312)

1. Sanguiphilus equinus Z. and K. 1949. (Vallee et Carre, 1904). (Trifur equirum Holmes 1948; Haemotophilus anemiae Ryzhkov 1950). Causes infectious anemia in horses. (p. 312)

2. Sanguiphilus ovis Z. and K. 1949 (Donation et Lestoquard, 1924). Causes pernicious anemia in sheep and goats. (p. 313)

3. Sanguiphilus canis Z. and K. 1949. (Trincas, 1906). Causes contagious anemia in puppies. (p. 313)

4. Sanguiphilus felis Z. and K. 1949. (Lawrence et Syverton, 1938). (Tortor felis Holmes 1948; Haematophilus felis Ryzhkov 1950). Causes infectious enteritis in cats. (p. 313)

Family III. Dermaphilaceae fam. nov. (p. 314)

Genus 1. Dermaphilus nom. nov. (p. 314)

Dermaphilus pecoris nom. nov. (Löffler et Frosch, 1897). (Hostis pecoris Holmes 1948; Microvirus pecoris Z. and K. 1949; Löffleria equi Ryzhkov 1950). Causes foot and mouth disease in cattle and other animals including man. (p. 314)

1. Dermaphilus pecoris fancus. (D. fancus). Type J of French authors. Type A, German authors.

2. Dermaphilus pecoris fancus. (D. germanicus). Type A, French authors, Type B, German authors.

3. Dermaphilus pecoris tertius (D. tertius). Type C, German author.

Order VI. Polyedralea ord. nov. (p. 316)

Family I. Polyedraceae fam. nov. (p. 316)

Genus 1. Polyedra nom. nov. (p. 316)

1. Polyedra bombycis nom. nov. (Cohn, 1872). Micrococcus bombycis Cohn 1872); Microsporidium polyedricum Bolle 1894; Micrococcus lardarius 1896; Chlamydozoon bombycis Prowazek 1907; Crystalloplasma polyedricum Prell 1918; Borrelina bombycis Paillot 1926). Cause of an icterus in mulberry silk worm (Bombyx mori) (p. 316)

2. Polyedra lymantriae nom. nov. (Hoffman, 1891) (Bacillus B. Hoffman 1891; Bacterium monachae Tabeuf 1892; Bacillus monachae Eckstein 1894; Crystalloplasma monachae Prell 1926; Borrelina efficiens Holmes 1948). Cause of a wilt disease in

Lymatria monacha (Species of butterfly or its other metamorphic stages). (p. 317)

3. Polyedra porthetriae nom. nov. (Glaser et Chapman, 1913). (Borrelina reprimens Holmes 1948). Cause of a wilt disease in silk worms (Porthetria dispar). (p. 317)

4. Polyedra prodeniae nom. nov. (Steinhaus, 1949) (Borrelina olethria Steinhaus 1949). Causes disease in Prodenia praefica (Butterfly or its other metamorphic stages.) (p. 318)

5. Polyedra coliatis nom. nov. (Steinhaus, 1948). (Borrelina campeoles Steinhaus, 1949). Cause of a wilt in Colias philodide eurytheme (butterfly). (p. 318).

6. Polyedra phrygonidiae nom. nov. (Chapman et Glaser, 1915). (Borrelina peremptor Steinhaus 1949). Cause of a disease in Phrygonidia californica. (p. 318)

7. Polyedra euxoae spec. nog. (Paillot, 1936). Cause of a poleic disease in Euxoa segetum. (p. 319)

8. Polyedra venessae spec. nov. (Paillot 1936). Cause of a poleic disease in a butterfly (Venessa utricae). (p. 319)

Genus 2. Capsulatus nom. nov. (p. 320)

1. Capsulatus cacoeciae nom. nov. (Bergold, 1948). (Bergoldia calypta Steinhaus 1949). Cause of a granulosa disease in a butterfly. (Cacoecia murinana). (p. 320)

2. Capsulatus peridromae nom. nov. (Steinhaus, 1947). (Bergoldia daboia Steinhaus 1949). Cause of a granulosa disease in a butterfly. (Peridroma margaritosa). (p. 320)

3. Capsulatus junoniae nom. nov. (Steinhaus, 1949).

(Bergoldia lathetica Steinhaus 1949). Cause of a granulosa disease in a butterfly (Junonia coenia) (p. 320)

4. Capsulatus estigmene nom. nov. (Steinhaus, 1949). (Bergoldia thompsonia Steinhaus 1949). Cause of a granulosa disease in an insect (Estigmene acraea). (p. 321)

5. Capsulatus pieris nom. nov. (Paillot, 1926). (Borrelina pieris Paillot 1926; Bergoldia brassicae Steinhaus 1949). Cause of a granulosa disease in an insect (Estigmene pieris). (p. 321)

6. Capsulatus euxoae spec. nov. (Paillot, 1936). Cause of a disease in an insect (Euxoa segetum). (p. 321)

7. Capsulatus pailloti spec. nov. (Paillot, 1936). Cause of a disease in an insect (Euxoa segetum). (p. 321)

Genus 3. Plasmophila nom. nov. (p. 322)

1. Plasmophila pieris nom. nov. (Paillot, 1926). (Borrelina brassicae Paillot 1926);(Paillotella pieris Steinhaus 1949). (p. 322)

Genus 4. Apioles nom. nov. (p. 322)

1. Apioles apis nom. nov. (White, 1913). (Morator aetatulae Holmes 1948). (p. 322)

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